



# MANUAL OF ARTILLERY AND RIFLE EXERCISES.

SAINT JOHN, N. B.  
DAILY TELEGRAPH STEAM BOOK AND JOB PRINT.  
1890.



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The following Manual has been prepared for the use of the New Brunswick Brigade Garrison Artillery by Captain and Adjutant C. F. LANGAN and Lieutenant J. B. M. BAXTER. Every officer, non-commissioned officer, and gunner of the Brigade is expected to supply himself with a copy.

J. R. ARMSTRONG, LIEUT.-COL.,  
*Commanding N. B. B. G. A.*

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ABBREVIATIONS : 0. Officer or Instructor.

1. Non-Commissioned Officer, or No. 1.

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*ERRATUM.*

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At page 38, under Arrange Stores, read 10 and 11, heavy drag rope each.

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# ARTILLERY DRILL.

## DRILL FOR 64PR R. M. L. GUNS ON COMMON STANDING CARRIAGES.

The detachment consists of 9 men and falls in two deep, No. 1, usually a non-commissioned officer, being on the left of the front rank.

### 0 Tell Off.

No 1, who is on the left of the detachment, takes a pace to his front, turns to his right and numbers himself 1; the right hand man of the rear rank numbers 2, the right hand man of the front rank 3, and so on; even Nos. in rear, odd Nos. in front.

After the detachment is told off No. 1 resumes his place on the left of the front rank.

The detachment is marched into the battery and halted in line facing the parapet, and to the left rear of the platform, in the position of *Detachment Rear*.

### 0 Take Post Under Cover.

" (or *Take Post at the Gun.*)

### 1 RIGHT TURN. DOUBLE MARCH.

The detachment stepping off wheels to its left at the left corner of the platform, the front rank filing to the left of the gun and the rear rank to the right. Nos. 2 and 3 halt close to the parapet and near the embrasure, 4 and 5 form on their right and left, and the whole turn to the right about together.

No. 1 follows in rear, keeping under cover as much as possible, and at drill forms up on the right of No. 5. 6 and 8 go to the cartridge store, 6 outside. 7 and 9 go to the shell store, 7 outside.

## GENERAL DUTIES.

- No. 1 Commands, directs or superintends boring and fixing fuzes, directs the gun into the line of fire in running up, and lays.
- No. 2 Searches, sponges, rams home, runs up, elevates and traverses.

- No. 3 Loads, uncaps or removes safety pin from fuze when in the bore, rams home, runs up, elevates and traverses.  
No. 4 Attends to side arms and supplies them to 2, runs up and attends to the elevating screw and coin in laying.  
No. 5 Attends to vent, runs up, makes ready and fires.  
No. 6 Supplies 3 with cartridges.  
No. 7 Attends to fuzes and brings up projectiles.  
No. 8 Attends to cartridge store and serves out cartridges to 6.  
No. 9 Attends to shell store, issues shells, tubes and fuzes.

## 0 Prepare For Action.

### 1 PREPARE FOR ACTION.

*The stores are brought up by the following numbers.*

- 1, Handspike (6 ft.), sights, and piece of chalk.
- 2, Handspike, and assists 4 with side arms (sponge, rammer, wadhook and shell extractor).
- 3, Handspike and elevating screw, removes the tampion from the muzzle.
- 4, Handspike, side arms and support for heads of side arms.
- 5, Handspike, tubes in box, lanyard, pricker and vent server.
- 6, Two cartridge cases, which he leaves at the cartridge store, bucket filled and brush (two drill cartridges for drill purposes.)
- 7, Fuzes, fuze and shell implements, which he obtains from No. 9.
- 8, Prepares to issue cartridges.
- 9, Provides a brush for cleaning shells, and prepares to issue shells, friction tubes and fuzes. He will loosen the fuze hole plug of shells to be first issued.

If the gun is prepared for drill only, 8 and 9 provide and hook a tackle to the eye-bolt on the rear axletree and to a holdfast in rear of the gun.

Directly the stores are brought up No. 1 will see that the fore sights fit properly, deflection leaves of hind sights work easily, the platform is clean, and will receive reports from Nos. responsible for any irregularity or deficiency in the gun, ammunition or stores.



The side arms are laid on the ground clear of the platform, to the right of the gun and parallel to it, heads to the rear and resting on the support, sponge nearest the gun, the shell extractor and wad hook so as not to interfere with the working of any gun of the battery, and convenient for the gun for which it is intended. The sponge bucket near the sponge head. The handspikes are laid down, two on each side of the platform close to the carriage, points to the front, bevelled side uppermost, those of 2 and 3 outside of and about 2 feet in advance of those of 4 and 5. No. 1's handspike in rear of the platform. 3 sees that the grooves are free from grit, 4 sees that the elevating screw is properly oiled, 5 straps the tube box around his waist on the right side, coils up the lanyard, doubling it twice, and passes the bight of it under the tube box strap, places the pricker in the loop on the side of the carriage, examines the vent server and places it in the vent, the loop of the vent server lanyard over one of the sights; he fills his box with friction tubes which he procures from 9.

**1 EXAMINE GUN.**

5 Drifts the vent, replaces the pricker in the loop, and the vent server in the vent.

2 Supplies himself with wad hook, searches the gun after the pricker is withdrawn and replaces the wadhook.

4 and 5 take a purchase with handspikes over the cheeks and under the breech.

3 withdraws the coin and puts in the elevating screw.

1 holds up the stool bed with a handspike applied over the bottom step of the carriage, to enable 3 to put in the elevating screw.

**1 LOWER.**

4 and 5 withdraw their handspikes and lay them down.

**TO LOAD.**

**0 Range (—) Yards. With (Common or Shrapnel) Shell. Load.**

**1 WITH — SHELL. LOAD. — FUZE.**

No 1 gives 7 the nature of shell and fuze required, and during the loading fixes his tangent scale at the required elevation.

2 places himself in a convenient position for sponging. He places his left foot in line with and about 12 inches

## ARTILLERY DRILL.

from the muzzle, steps to his right with his right foot and looks to his left rear.

8 issues a cartridge to 6, who brings it up in a cartridge case and places it on the ground on 3's right front.

9 issues a shell to 7 who brings it up point to his right, having fixed a fuze according to No. 1's directions; he places himself on the right rear of 6.

4 doubles out, halts in line with the sponge head, turns to his left, picks up the stave with his right hand back under, six inches from the head, turns three quarters left about, and in doing so, lifts the sponge over his head, allowing the end of the stave to rest on the ground. His left hand back under meets the stave close to the sponge, his right hand is slipped up the stave about two feet. He then moves toward the muzzle and passes the stave into the embrasure in such a manner that 2 can conveniently lay hold of it, waiting at the left rear of 2, facing the gun, to receive the sponge.

2 takes the sponge in a horizontal position from 4, left hand back down, right hand back up, brings it in line with the axis of the gun, enters the head into the bore, *being careful to observe that the vent server is in the vent*, slides his hands along the stave to his right as far as he can reach, sends the sponge up the bore, slides his hands out again, and forces the sponge hard home, gives it two half turns from him, pressing it against the bottom of the bore, withdraws the sponge hand over hand, turning it from him, cleaning the bore well. When the sponge arrives near the muzzle he jerks it out, his hands then should be in the position they were in when he introduced the sponge into the bore. He then hands the sponge to 4.

6, after the sponge is withdrawn, uncovers the cartridge case, and as soon as 3 has withdrawn the cartridge, goes back to the cartridge store.

3, as soon as the sponge is withdrawn, takes the cartridge from the case with his left hand, moves up and places it in the bore; he then slews his body to the right and receives a shell from 7 and puts it in the bore, withdraws the safety pin or uncaps the fuze, and places himself in a corresponding position to 2.

4 receives the sponge from 2, taking it with his right hand back up near the head, allows the end of the stave to fall on the platform, steps to his left, turns three quar-

ters right about, passing the sponge over his head, lays it down, takes up the rammer as before detailed for the sponge and hands it to 2. He then remains in position to receive the rammer.

2 receives the rammer, right hand about the centre, *back down*, left hand as near the head as possible *back up*; as soon as the cartridge and shell are put in he enters the head into the bore and forces them home hand over hand.

3 assists 2 to ram home. When the cartridge and projectile are home he quits the stave and goes under cover.

2 then springs the rammer, steps out, hands it to 4 and goes under cover.

4 receives the rammer as soon as 2 has sprung it. He lays it down as he did the sponge and goes under cover.

If the command "Under Cover" be given during the drill, all the Nos. at once lay down their stores and double under cover.

If "Stand Fast" be given, every No. remains steady, until "Go On" is given, except when loading, in which case the loading will be completed.

## TO RUN UP.

### 1 RUN UP.

Directly the gun is loaded No. 1 gives 'Run Up,' and applies his handspike under the rear axletree to guide the gun.

2, 3, 4 and 5 take up their handspikes at the centre, with the hands next the parapet, *back up*, the other hands at the small ends *back down*; stepping up to their respective axletree arms they apply their handspikes, bevels up, under and in rear of them. Taking the time from 2 they heave together, using short, quick purchases, until the front trucks nearly touch the hurter.

### 1 HALT.

When the front trucks nearly touch the hurter No. 1 gives 'Halt,' slides his handspike to the rear, clear of the recoil, and looks over the sights, steadying himself by leaning on the cascable.

Nos. 2 and 3 withdraw their handspikes and drop their points to the ground, turn to the rear and step outwards, holding their handspikes diagonally across the body, out-

ward hands at the small ends back under, as high as the ear, inward hands back up, resting on the handspike at the full extent of the arm, heels close together, bevelled side of the handspike uppermost.

Nos. 4 and 5 at the same time withdraw their handspikes and lay them down.

4 kneels on his *left* knee in rear of the right cheek of the carriage, takes hold of the large coin with both hands, or the small coin with his left hand, or works the elevating screw, by No. 1's directions.

5 goes under cover and prepares a tube. He puts the hook of the lanyard into the eye of the tube, back of the hook down, and holds the coil of the lanyard in his left hand.

#### TO LAY, MAKE READY AND FIRE.

##### 1 ELEVATE.

2 and 3 step forward in line with the breech, apply their handspikes bevels down over the steps and under the breech, and bear down; 4 slightly withdraws the coin.

##### " LOWER.

2 and 3 allow the small ends of their handspikes to rise gently.

##### " COIN.

2 and 3 withdraw their handspikes and step outwards, 4 at the same time forcing the coin sharp home.

If No. 1 gives 'With Screw, Elevate (or Depress),' number 4 will work the screw until 'Halt' is given; the other numbers stand fast.

##### 1 TRAIL RIGHT (*or Left*). HALT.

If the muzzle is to go to the left, No. 1 gives 'Trail Right,' and when the muzzle is sufficiently to the left 'Halt.'

At 'Trail Right' No. 2 moves around on his right foot to the rear of the axletree arm, and applies his handspike under it to row. No. 3, stepping to his left, takes a purchase under the rear of the cheek and stands ready to heave over the trail. They heave together until 'Halt' is given, and then remain steady until the next order is given.

'Trail Left' is the converse of the above.

**1 EXTREME RIGHT (or Left). HALT.**

If much traversing is required the above order is given, when 4 or 5, according to the side, moves up and takes a purchase with his handspike in front of the rear truck in addition to the other Nos.

As soon as the gun is laid No. 1 *lowers his tangent scale*, except when firing at a *moving object*.

Should no order to fire be given when the gun is laid, No. 1 gives the words 'Under Cover.'

**0 Commence Firing (or Fire [—] Round.)**

**1 NO. (—) READY.**

5 presses a tube into the vent with his right thumb, steps clear of the recoil, shifts the lanyard to his right hand and extends it, keeping his hand level with the vent, facing the gun.

2 and 3 lay down their handspikes and with 4 go under cover.

**1 NO. (—) FIRE.**

5, at the word 'No.,' stretches the lanyard looking toward No. 1. At 'Fire' he draws the lanyard strongly towards his left breast without a jerk, drifts the vent, replaces the vent server and pricker, and goes under cover, replacing the lanyard under his belt.

No. 1 does not again give 'Load' until 5 has *replaced the vent server*.

**TO RUN BACK.**

**1 RUN BACK.**

The detachment doubles out and mans the fall of the tackle arranged by 8 and 9, and heaves the gun back into position for loading.

When the tackle is not used, 2, 3, 4 and 5 apply their handspikes in front of the axletree arms, taking the time from No. 5, and heave together.

**11 HALT. UNLOAD.**

When the gun has been sufficiently run back, No. 1 gives 'Halt, Unload.' 2 and 3 withdraw the charge, 4 supplying the shell extractor or wadhook, as the case may be. The other numbers resume their places. 6 and 7 come up to receive the cartridge and shell and take them back to the store.

**0 Cease Firing. Replace Stores.****1 ELEVATE.**

4 and 5 apply their handspikes over the steps of the carriage and bear down. 3 takes out the elevating screw.

**" LOWER. COIN. REPLACE STORES.**

The stores are replaced by the Nos. who brought them up and the Nos. go under cover.

**0 Detachment Rear.**

No. 1 doubles to the left rear of the platform, faces to the left of the gun, and gives—

**1 OUTWARDS TURN.**

2 and 4 turn to their left, 3 and 5 to their right.

**" DOUBLE MARCH.**

4, followed by 2, wheels to the right, and 5, followed by 3, wheels to the left; they come into file at the rear of the gun and when clear of the platform wheel to the right and around No. 1's left shoulder, 6, 7, 8 and 9 coming up into their places. When 2 and 3 have passed No. 1 he gives—

**" HALT. FRONT.**

No. 1 then changes his flank by the rear.

**0 Stand at Ease.**

## CHANGING ROUNDS.

**0 Change Rounds.****1 CHANGE ROUNDS.**

2 becomes 4, 4 1, 1 9, 9 8, 8 7, 7 6, 6 5, 5 3, 3 2; the numbers double to their places. In changing rounds, 4 to 1 and 3 to 2 double round the breech of the gun to their places, passing left arm to left arm.

---

**DRILL FOR 64PR. R. M. L. GUNS ON TRAVERSING PLATFORMS.**

The detachment consists of 9 men, and is told off the same as for guns on standing carriages.

**0 Tell Off. Take Post Under Cover.****1 RIGHT TURN. DOUBLE MARCH.**



GENERAL DUTIES.

- No. 1 Commands, directs or superintends boring and fixing fuzes, holds on to preventor rope and lays.
- No. 2 Searches, sponges, rams home, runs up, elevates and traverses.
- No. 3 Loads, uncaps or removes safety pin from fuze when in the bore, rams home, runs up, elevates and traverses.
- No. 4 Attends to side arms and supplies them to 2, runs up, attends to the elevating screw and coin in laying.
- No. 5 Attends to vent, supplies wedge wads, rams up, holds on to the preventor rope, makes ready and fires.
- No. 6 Supplies 3 with cartridges.
- No. 7 Attends to fuzes and brings up projectile.
- No. 8 Attends to cartridge store and serves out cartridges to 6.
- No. 9 Attends to shell store and issues shells, tubes and fuzes.

**0 Prepare for Action.**

**1 PREPARE FOR ACTION.**

- 1 Provides and fixes sights, a piece of chalk and preventor rope, which he attaches to the carriage, assisted by 3 (if necessary), takes two turns around the bollard, the running end coming off to the left at the top.
- 2, Handspike, trucklever, iron-shod lever, and assists 4 with side arms.
- 3, Handspike, trucklever, iron-shod lever and elevating screw. Removes muzzle tampion.
- 4, Side arms and support.
- 5, Wedge wads, tubes in box, lanyard, pricker and vent server.
- 6, Two cartridge cases (which he takes to the cartridge store), bucket filled and brush, two drill cartridges for drill purposes.
- 7, Fuzes, fuze and shell implements, one set of tackle.
- 8, Prepares to issue cartridges.
- 9, One set of tackle and a brush for cleaning projectiles. Prepares to issue shells, tubes and fuzes.

The handspikes and iron-shod levers are laid down bevelled sides uppermost, the handspikes nearest the gun, the truck-levers between them and the iron-shod levers, the whole with

their points to the front, hooks of the truck levers to be uppermost.

The standing blocks (in this case those to which the end of the fall is made fast), are hooked by 7 and 9 to the rear eye-bolts of the platform, the tackles rounded in, and the end of the falls coiled down.

# 1 EXAMINE GUN.

*As with guns on standing carriages.*

## 0 Range (——) Yards. With (Shrapnel (or Common) Shell. Load.

### 1 WITH —— SHELL. LOAD. —— FUZE.

No. 2 mounts on the side piece ready for sponging.

No. 3 mounts on the step to put in the cartridge, and on the platform to put in the projectile, and a wedge wad after they have been rammed home.

### " RUN UP.

No. 1 holds on the preventor rope, 2, 3, 4 and 5 take up truck levers, 2 and 3 at the small ends and 4 and 5 at the roller ends, 4 and 5 hook the points to the eye-bolts, 2 and 3 haul down the small ends, 4 and 5 place the pawls, 4 goes under cover, 5 holds on to the preventor rope behind No. 1, 2 and 3 guide the levers whilst the carriage is in motion. When the gun is in position No. 1 gives—

### 1 HALT.

2 and 3 heave down the small ends of the levers, 4 and 5 throw back the pawls, 2 and 3 then allow the small ends of the levers to rise gently, 4 tightens the compressor if so fitted, 5 takes in the slack of the preventor rope.

2 and 3 pick up their handspikes and stand ready to elevate, 4 attends to the coin and elevating screw.

### 1 ELEVATE. LOWER. COIN.

At 'Coin' 2 and 3 lay down their handspikes, and take up the ironshod levers to traverse; 5 prepares a tube.

### " TRAIL RIGHT (or Left). HALT.

2 and 3 apply their iron shod levers on the sides required to be traversed; at 'Halt' they scotch up.

If tackles are used, No. 1 gives 'Hook traversing tackle,' when 4 and 5 hook the double blocks to the rings or holdfasts; at 'Trail Right or Left,' 2 and 4, or 3 and 5 haul on the tackle on their respective sides.

**0 Fire (—) Round.**

**1 No. (—) READY.**

2 and 3 withdraw their levers and place them bevels up as scotches under the trucks, the levers resting on the racers, and with 4 go under cover. No. 5 hands a tube with lanyard attached, to No. 1, who puts it in the vent. No. 1, giving the word 'Ready,' jumps off the platform, and 5 seizing the lanyard, stands ready to fire.

**" No. (—) FIRE.**

As soon as the gun is fired, 5 drifts the vent, replaces the pricker and vent server, places the lanyard under his belt, and hooks the preventor rope (except at drill) and goes under cover.

**1 RUN BACK.**

4 and 5 overhaul the tackle, (separate the blocks), and hook the front blocks to the front eye-bolts of the carriage.

2, 3, 4 and 5 take up and apply the truck levers. No. 1 standing between the cheeks, holds the small ends of the truck levers and guides them.

All the numbers except No. 1 then man the falls on their respective sides and stand ready to heave.

No. 4 slackens the compressor.

**" HEAVE. HALT. UNLOAD.**

At 'Heave' all the Nos. except No. 1 man the falls on their respective sides and haul the gun back.

At 'Halt' No. 1 hauls down the levers by the ropes until the pawls fall; the levers are then allowed to come up, No. 1 rising with them.

2, 3, 4 and 5 unhook the truck levers and lay them down. 5 hooks the preventor rope.

4 and 5 unhook the front blocks and carry them to the rear, overhaul them, lay them down clear of the racers, and coil down the ends of the falls.

No. 1 takes in the slack of the preventor rope.

**0 Cease Firing. Replace Stores.**

**1 ELEVATE. LOWER. COIN. REPLACE STORES.**

**0 Detachment Rear.**

**1 OUTWARDS TURN. DOUBLE-MARCH. HALT. FRONT.**

**0 Stand at Ease.**

## ARTILLERY DRILL.

## DRILL WITH 40PR. R. B. L. GUNS ON TRAVELLING CARRIAGES.

The detachment consists of 9 Nos. and falls in two deep, No. 1 on the left.

**0 Tell Off.**

As detailed for standing gun drill.

**0 Take Post at the Gun.**

" *(or Take Post Under Cover.)*

**1 RIGHT TURN. DOUBLE MARCH.**

When there is no parapet the detachment files on the gun, 2 and 3 halting in line with the breech, 4 and 5 the centre of the trail, the whole 1 yard from it; No. 1 in rear of the gun, 8 and 9 in rear of the limber box, 6 and 7 outside 8 and 9.

## GENERAL DUTIES.

- No. 1 Commands, directs or superintends boring and fixing fuzes, directs the gun into the line of fire when running up, and lays.
- No. 2 Runs up, sponges (if necessary), rams home and traverses.
- No. 3 Runs up, removes safety pin, loads, rams home and traverses.
- No. 4 Runs up, attends to breech screw, vent piece, and tin cups, when used, attends to side arms and supplies them to 2, and to elevating screw in laying.
- No. 5 Runs up, attends to breech screw and vent piece, primes, makes ready and fires.
- No. 6 Supplies 3 with cartridges.
- No. 7 Attends to fuzes and brings up projectile.
- No. 8 Attends to cartridge store or limber and serves out cartridges to 6.
- No. 9 attends to shell store or limber, and issues shells, tubes, and fuzes.

## PREPARE FOR ACTION.

**0 Prepare for Action.****1 PREPARE FOR ACTION.**

*The stores are brought up as follows:—*

- 1, 6 ft. handspike, sights, piece of chalk, file for vent piece, hammer and punch.

- 2, 6 ft. handspike, and assists 4 with side arms.
- 3, 6 ft. handspike and elevating screw, he also removes apron and tampion.
- 4, 6 ft. handspike, side arms and support, tin cups in pocket and tin cup extractor.
- 5, 6 ft. handspike, primers in pocket, tubes in box, lanyard, oil can and hemp.
- 6, Two cartridge cases which he leaves at the cartridge store or limber, bucket filled and brush, two drill cartridges for drill purposes.
- 7, Fuzes, fuze and shell implements.
- 8, Prepares to issue cartridges.
- 9, Provides a brush for cleaning shell, prepares to issue shells, tubes and fuzes, and examines shell.

The side arms are laid down to the right of the gun and parallel to it, heads to the *front*, resting on the support, sponge nearest the gun and in line with the breech when the gun is run up. Handspikes are laid down as at standing gun drill. The tin cup extractor is placed in a loop in the carriage. 5 straps the tube box round his waist on the right side and the primer pocket on his left.

# 1 EXAMINE GUN.

No. 4 moves the elevating screw handle until the axis of the bore is horizontal; he then opens the breech by taking the lever handle in his right hand, back up, and swings it around a half circle towards him; 5 then steps in and with 4 lifts the vent piece out and lays it on top of the breech coil.

# 1 CLEAR (or *Sponge Out*).

At 'Clear' 4 and 5 drop in the vent piece, 5 then takes the lever handle in his left hand, back up, and screws up the breech screw, and with 4 goes under cover.

If 'Sponge Out' is given, 2 provides himself with the sponge and sponges. No. 1 then gives 'Clear,' and 4 and 5 act as detailed above, 2 passes the sponge over his head as he turns left about and goes under cover.

No 1 then directs 5 to fire a tube.

# 0 Range (—) Yards.

" With Segment (*Common or Shrapnel*) Shell (or *Case Shot*) Load.

Solid shot used for practice only.

## 1 RUN UP.

2, 3, 4 and 5 take up their handspikes, 2 and 3 applying theirs over the spokes of the wheels, in front under the brackets close to the breast and bear down; 4 and 5 apply theirs as levers of the second order under the rear part of the wheels. All the numbers face to the rear.

No. 1 applies his handspike under the trail eye, to guide the gun into the line of fire.

## 1 HALT.

As soon as the gun is sufficiently run up, No. 1 gives 'Halt,' slides his right hand, back up, to the centre of his handspike and throws it to the rear; 2, 3, 4 and 5 withdraw theirs, turn inwards, lay them down and go under cover.

## 1 WITH — SHELL (or Shot) LOAD. — FUZE.

No. 1 sees that the sights are in order.

4 unscrews the breech screw and with 5 lifts out the vent piece, 4 removing the old tin cup with the extractor, 5 cleans the vent piece, if required, and drops in a primer worsted end down, 4 and 5 then go under cover. Should 'Sponge Out' be given, 2 receives the sponge from 4, introduces it into the bore, and sponges out in two motions; he then withdraws the sponge, cleaning the chamber well, and hands it back to 4.

No. 4 lifts the sponge with his left hand, back under, turning to the right about as he does so, and hands it to 2, waits for it, replaces it, and then takes up the rammer with his left hand, back under, close to the rammer head, hands it to 2, and goes under cover or takes post.

2 and 3 step in ready to load, 3 receives a shell from 7 and removes the safety pin, 2 then receives the rammer from 4 and with 3 rams home, their outward hands back under, inner hands back up; 3 then turns to his right, withdraws the cartridge from the case, and places it in the bore, choke to the front, and goes under cover. 2 presses the cartridge home gently, withdraws the rammer, allowing the head to fall, seizing it near the head with the left hand back up, turns left about, replaces it, and goes under cover.

As soon as the gun is loaded, 4 and 5 step in, 4 passes a tin cup down the slot, edge to the front, and presses it into the bore, 4 and 5 then drop in the vent piece, 5 screws up, and 4 gives two taps. 4 and 5 then go under cover.



6 brings up a cartridge in case and places it on the right of 3, 7 brings up a shell and hands it to 3.

8 issues a cartridge to 6.

9 issues a shell to 7.

**1 ELEVATE (or Depress). HALT.**

No. 1 looks over the sights, steadying himself by leaning on the lever. 2 and 3 pick up their handspikes and go to the end of the trail, facing to the rear, ready to traverse. 4 works the screw until 'Halt' is given, 5 makes ready a tube.

**" TRAIL RIGHT (or Left). HALT.**

*Or Extreme Right (or Left). Halt.*

**0 Commence Firing (or Fire — Rounds).**

**1 NO. — READY.**

No. 1 lowers his tangent scale and gives 'Ready,' 5 presses a tube into the vent with his right thumb, 2 and 3 lay down their handspikes and with 4 go under cover.

**" NO. (—) FIRE.**

At the word 'No.' 5 stretches his lanyard looking towards No. 1.

At 'Fire' 5 draws the lanyard strongly towards his body without a jerk, replaces it under his belt, and goes under cover.

**" RUN BACK. HALT.**

The detachment double out and man the fall, which is arranged by 8 and 9, and haul the gun back until 'Halt' is given, No. 1 scotches the right wheel.

**0 Cease Firing. Replace Stores.**

**1 EXAMINE GUN. SPONGE OUT. CLEAR.**

4 and 5 unscrew and take out vent piece, 2 forces the projectile and cartridge through the bore with the sponge, 6 and 7 receive them at the muzzle and carry them to the rear, at 'Clear' 4 and 5 replace the vent piece and screw up.

**" DEPRESS. HALT. REPLACE STORES.**

**0 Detachment Rear.**

**1 RIGHT ABOUT TURN (or Outwards Turn).**

**" DOUBLE MARCH. HALT. FRONT.**

## Changing Rounds in Action

2 becomes 4, 4 1, 1 9, 9 8, 8 7, 7 6, 6 5, 5 3, and 3, 2.

## Changing Rounds Limbered Up.

2 becomes 4, 4 6, 6 8, 8 1, 1 9, 9 7, 7 5, 5 3, and 3, 2.

## SHIFTING A 40PR. R. B. L. GUN FROM TRAVELLING TO FIRING TRUNNION HOLES.

This must be done while the gun is limbered up.

**0 Shift the Gun from Travelling to Firing Trunnion Holes.****1 PREPARE TO SHIFT THE GUN.**

2, 3, 4 and 5 cast loose the side arms and handspikes and unbuckle straps, 2 and 3 take off capsquares, 4 and 5 scotch the gun wheels with handspikes, 4 in front and 5 in rear.

**" PREPARE TO BEAR DOWN.**

2 places his handspike in the bore double manned by 3.

4 passes his handspike across 2's to 5.

8 and 9 make fast two drag-ropes to the breech and pass the ends towards the muzzle, they then double man 2's handspike.

**" BEAR DOWN.**

2, 3, 4, 5, 8 and 9 bear down.

6 hands the roller to No. 1, who places it as near as possible under the centre of gravity and gives -

**" COME UP.****" PREPARE TO LIFT.**

4 crosses his handspike under that in the bore to 5; 1, 6 and 7 man the ropes.

**" LIFT AND HEAVE.**

The gun is raised out of the travelling holes and hauled forward until the trunnions fall into the firing holes. The drag-ropes are cast off by 8 and 9. The handspike men should keep their eyes on the gun so as to be prepared for its descent.

**" PREPARE TO BEAR DOWN. BEAR DOWN.**

2, 3, 4 and 5 bear down.

No. 1 removes roller and hands it to 6, who straps it on the carriage.

1 and 7 put in the elevating gear.

**1 COME UP.**

The handspikes are withdrawn and laid down.

No. 1 puts on his sights, 2 and 3 place the capsquares, 4 and 5 unscotch the wheels.

The detachment then forms the order of march.

The operation of shifting from firing to travelling trunnion holes is the converse of the above.

**TO UNLIMBER.**

This must be done when the gun is in the firing trunnion holes.

**0 Unlimber.**

**1 PREPARE TO UNLIMBER.**

1 unkeys the keep chain and with 2, 3, 4, 5, 6 and 7 stands to the trail, 2 and 3 nearest the gun. 9 goes to the shafts and 8 to the splinter bar on the near (left) side.

**" LIFT.**

The trail is lifted clear of the pintail.

**" LIMBER DRIVE ON.**

The limber is hauled ahead.

**" LOWER.**

The trail is lowered to the ground.

**TO LIMBER UP.**

**0 Limber Up.**

**1 PREPARE TO LIMBER UP.**

The numbers place themselves as for unlimbering.

**" LIFT.**

The numbers lift the trail until the muzzle rests on the ground; they then close in towards the breech and haul down the trail when the number is in position for limbering up. No 1 keys up, and the detachment forms the order of march.

*ARTILLERY DRILL.***POSITION OF DETACHMENT WHEN LIMBERED UP.****IN ORDER OF MARCH.**

No. 1 in line with the point of the near shaft and two yards on the left of it.

2 and 3 in line with the axletree of the gun carriage.

4 and 5 in line with the centre of the trail.

6 and 7 in line with the axletree of the limber.

8 and 9 in line with the splinter bar.

The Noe. stand covering, one yard from the wheels.

**IN FRONT.**

Two deep, two yards in front of the shafts or leaders' heads.

**IN REAR.**

Two deep, two yards in rear of the muzzle of the gun.

**RIGHT OR LEFT.**

Two deep in line with the gun axletree, one yard to the right or left of the wheel.

**CHANGE OF POSITION OF DETACHMENTS.****TO FORM THE ORDER OF MARCH FROM DETACHMENT FRONT.****0 Form the Order of March.****1 RIGHT TURN. DOUBLE MARCH.**

No. 1 turns with the detachment, 2 and 3 wheel to their right and open out; each number halts when at his post; they turn to the front together, looking to 2, who turns about immediately he arrives at his post.

**TO FORM THE ORDER OF MARCH FROM DETACHMENT REAR, RIGHT OR LEFT.****0 Form the Order of March.****1 LEFT TURN. DOUBLE MARCH.**

When the detachments are in rear or on the right they proceed direct, but when on the left they countermarch to the left; No. 1 heads the rear rank. Each No. halts when at his post.

TO CHANGE FROM FRONT TO REAR.

**0 Detachment Rear.**

- 1** RIGHT TURN. DOUBLE MARCH. REAR TURN. RIGHT TURN.  
HALT. FRONT.

When the detachment is clear of the gun it turns to the rear; when in line with the position of detachment rear it turns to the right, and when in rear of the muzzle it halts and fronts.

TO CHANGE FROM REAR TO FRONT.

**0 Detachment Front.**

- 1** RIGHT TURN. DOUBLE MARCH. FRONT TURN. LEFT TURN.  
HALT. FRONT.

When the detachment is clear of the gun it turns to its front; when in line with the position of detachment front, it turns to its left, and when in front of the leading horses it halts and fronts.

TO CHANGE FROM REAR TO RIGHT OR LEFT.

**0 Detachment Right (or Left).**

- 1** RIGHT (OR LEFT) TURN. DOUBLE MARCH. FRONT TURN.  
HALT.

The detachment turns to its front when one yard clear of the gun wheel and halts when in line with the axletree.

TO FORM DETACHMENT REAR FROM THE ORDER OF MARCH.

**0 Detachment Rear.**

- 1** RIGHT ABOUT TURN. DOUBLE MARCH. HALT. FRONT.

2 and 3 close to their centre and wheel to their left, marking time when opposite the off wheel and two yards from it; as soon as the detachment has closed up, it is halted and turned to the front.

TO FORM DETACHMENT FRONT FROM THE ORDER OF MARCH.

**0 Detachment Front.**

- 1** DOUBLE MARCH. HALT. FRONT.

No. 1 doubles out two yards in front of the near shaft, turns to his right and gives 'Double March.' 8 and 9, fol

*ARTILLERY DRILL.*

lowed by the other numbers, double out. As soon as 8 is clear of the shafts he inclines towards 9. When 8 and 9 arrive in line with No. 1, they wheel to their left and mark time; when the detachment is closed up No. 1 gives 'Halt, Front,' turning to the front himself at the same time.



## REPOSITORY EXERCISES.

### ELEMENTARY INSTRUCTION.

The detachment consists of 19 Nos. and is told off the same as for M. L. gun drill.

#### 0 Tell Off. Take Post for Exercise.

1 TAKE POST. RIGHT (or Left) TURN. DOUBLE MARCH. HALT. INWARDS TURN.

2 and 3 halt in line with the muzzle, even Nos. on the right of the gun, odd Nos. on the left, the whole facing inwards.

### GENERAL DUTIES.

No. 1 Commands.

Nos. 2, 3, 4 and 5 muzzle handspikemen.

Nos. 6 and 7 place short skidding, scotches, rollers, fulcrums for the handspikes or levers, and assist to lash steadying handspikes; 16 and 17 assist when required.

Nos. 8 and 9 place and attend to steadying handspikes, make arrangements for slewing the trunnions, and supply 6 and 7 with rollers, if not engaged in steadying the gun.

Nos. 10 and 11 place drag ropes on muzzle and breech, the former on the muzzle, the latter on the breech.

Nos. 8, 9, 10 and 11 place long skids and planks, 18 and 19 assist when required.

Nos. 12, 13, 14 and 15 breech handspikemen.

When two parbuckle ropes are used they are fixed by 6 and 12, 7 and 13. 12 and 13 fix the standing ends, 6 and 7 pass the running ends round the gun. The even Nos. haul on the muzzle, the odd on the breech, the lowest Nos. next the gun. 2 and 3, or 2, 3, 4 and 5 assist with handspikes and scotches on their own sides. When one parbuckle rope is used 6, 7, 12 and 13 pass it round the gun in rear of the trunnions the requisite number of times, and 13 makes it fast to one of the trunnions, or holds on to the end, as required.

In fixing tackies, 10 and 11 fix the standing blocks, 12 and 13 the movable blocks.

## ARTILLERY DRILL.

When it is necessary to fix steadying handspikes No. 1 gives the command "Fix Steadying Handspikes." 8 and 9 each lay a 7 foot handspike over the gun, bevel down, so that the points may be over the trunnions on the opposite side. 8 makes a timber hitch on the right trunnion with a lashing rope, and takes three or four turns around his own handspike, the point of that of 9, and the trunnion. 9 makes fast his own handspike and that of 8 in the same way on his own side; they frap the returns at the same time, and make fast with a clove hitch, 6 and 7 holding the handspikes in place whilst they are being lashed.

Before commencing any exercise it should be ascertained that the men know their several duties, by proving the Nos. thus: 'Muzzle Handspikemen, Prove,' etc.

## STORES REQUIRED.

The following stores should be brought up by the Nos. who are to use them, viz.:

8 handspikes, by the handspikemen.

4 3'x6"x9"

2 3'x6"x6"

2 3'x4"x4"

2 3'x3"x3"

4 large, 4 medium, 4 small scotches,

pieces of skidding,

by 6 and 7, assisted  
by 16 and 17.

2 lashing ropes 3 fathoms long, by 8 and 9.

2 drag ropes, by 10 and 11.

Parbuckle ropes, tackles and selvagees if required, by 12 and 13.

## 0 Arrange Stores.

## 1 ARRANGE STORES.

The handspikes are laid down in rear of the Nos. who brought them up, the points of the handspikes inwards on the right side of the handspike Nos., at right angles to the gun. The skidding also in rear of the Nos. who provide it, parallel to the handspikes, the scotches alongside the skidding, the drag ropes in rear of the Nos. who brought them up.

# RAISING A GUN ON TO SKIDDING.

*First and Second Order of the Lever.*

## 0 Raise the Gun on to Skidding.

1 WITH HANDSPIKES, FIRST, or Second, ORDER.

1 PREPARE TO RAISE THE MUZZLE (or Breech).

" BEAR DOWN, or Lift. COME UP, or Lower.

" BEAR DOWN, or Lift. COME UP, or Lower.

" SCOTCH UP. ARRANGE STORES. TAKE POST.

The muzzle and breech are raised alternately, 6 and 7 building and scotching up the gun.

If necessary, in raising the muzzle or breech, 12, 13, 14 and 15 will be ordered to double man the handspikes of 2, 3, 4 and 5, or the reverse.

The 1st order of the lever is when the fulcrum, or point on which the lever rests, is between the weight and the power. Example: Elevating a gun.

The 2nd order is when the weight is between the power and the fulcrum. Example: Traversing or running up.

In raising a gun from the ground on to skidding the muzzle should be raised first as giving the easiest lift. In lowering, the contrary.

*Slewing the Trunnions of a Gun* is turning a gun on its axis, so as to bring the trunnions into any required position.

*Slewing a Gun end for end* is turning it round, not allowing it to revolve on its longer axis.

*Cutting a Gun* is to cause it to move horizontally without rolling, by moving breech and muzzle alternately in the required direction. The end of the gun not to be moved should be scotched up.

*Pinching a Gun* is moving it by short heaves of the handspikes in the required direction without allowing it to turn on its axis.

*Rowing a Gun* is moving it in the direction of its length. At 'Row' and 'Heave,' the Nos. bear down and bring the small ends of the handspike smartly in a direction opposite to that in which the gun is to move, the Numbers on the drag rope hauling at the same time.

## ARTILLERY DRILL.

RAISING A 64PR. GUN ON GARRISON STANDING  
CARRIAGE OUT OF THE TRUNNION  
HOLES, AND THE CONVERSE.

## STORES REQUIRED.

8 handspikes, 12 scotches, assorted.  
3 skids, oak, 3'x4"x4".

**0 Raise the Gun out of the Trunnion Holes.**

**1 REMOVE SIGHTS AND FITTINGS. SCOTCH UP TRUCKS.**

**" RAISE THE GUN OUT OF THE TRUNNION HOLES.**

**" PREPARE TO BEAR DOWN THE MUZZLE.**

2 places a handspike in the bore, point first, 3 one under it as a wedge, double manned by 8 and 9; 4 places a handspike over and across that of 2, close to the muzzle, to 5, double manned by 10 and 11; 12 a handspike over the neck of the piece to 13, double manned by 14 and 15; 16 a handspike over the chase to 17, double manned by 18 and 19, the whole looking towards the gun.

**" BEAR DOWN. COME UP. SCOTCH UP.**

At 'Bear Down,' 6 and 7 remove elevating screw, 7 placing a 4-in. piece on top step. At "Come Up" the gun is allowed to rest on the 4-in. piece. At "Scotch Up" 6 and 7 scotch up.

**" PREPARE TO LIFT.**

3 shifts his handspike to lie over that of 2, 4 underneath those in the bore, 12 and 16 shift theirs underneath the gun.

**" LIFT. LOWER. SCOTCH UP.**

At 'Lift,' 6 passes a 4-in. skid through the trunnion holes. The gun is allowed to descend on the 4-in. piece and scotched up. Lowering into the trunnion holes is the converse of the foregoing.

SHIFTING A 64PR. FROM ONE CARRIAGE TO ANOTHER  
BY PLANK AND ROLLER.**0 Tell off. Take Post for Exercise.**

**1 RIGHT TURN. DOUBLE MARCH.**

# REPOSITORY DRILL.

33

1 HALT. INWARDS TURN.

0 Arrange Stores.

1 ARRANGE STORES.

0 Shift the Gun by Plank and Roller, Breech  
(or Muzzle) Foremost.

1 PLACE THE CARRIAGE.

2, 3, 4 and 5 place the carriage.

" RAISE THE GUN OUT OF THE TRUNNION HOLES.

" PREPARE TO BEAR DOWN. BEAR DOWN. COME UP.

" PREPARE TO LIFT. LIFT. LOWER. SCOTCH UP.

" FIX STEADYING HANDSPIKES, BREECH AND MUZZLE DRAG  
ROPES.

" PLACE PLANK AND ROLLERS. TAUT.

" ON THE BREECH DRAG ROPE. HEAVE. HALT.

Highest Nos. go to the breech drag rope, remaining Nos.,  
except 1, 6, 7, 8 and 9, hold on the muzzle drag rope.

The gun is brought over the trunnion holes.

" PREPARE TO BEAR DOWN. BEAR DOWN. COME UP.

" REMOVE PLANK AND ROLLERS.

## MOUNTING AND DISMOUNTING ORDNANCE.

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### MOUNTING OR DISMOUNTING A 64PR. UP OR DOWN THE REAR BY SKIDS AND ROLLERS.

The detachment consists of 19 Nos., told off as for M. L. gun drill.

#### **0 Tell Off. Take Post for Exercise.**

#### **1 TAKE POST. RIGHT TURN. DOUBLE MARCH. HALT. INWARDS TURN.**

The officer or instructor will explain to the detachment the nature of the work to be done, so that the Nos. may know the stores required to be brought up.

#### **0 Arrange Stores.**

#### **1 ARRANGE STORES.**

2, 3, 4 and 5 bring a handspike each.

6 and 7, 12 scotches, 3 skids 3'x4"x4", 1 roller 14"x5", 2 rollers, 24"x5", 1 ground roller, two mauls, and two 7 ft. handspikes.

8 and 9, lashing each, 18' long.

8, 9, 10 and 11, two long skids, 14'x8"x8", 2 planks, oak, half, 4'x12"x3", two planks, fir, whole, 10'x17"x3".

10 and 11 a heavy drag rope each.

12, 13, 14 and 15 a handspike each.

12 and 13 set of luff tackle each and two selvagees.

16 and 17 assist 6 and 7.

18 and 19 assist 8 and 9.

#### TO MOUNT THE GUN.

The gun should be resting on a ground roller just in rear of its centre of gravity, and the carriage placed in front of it.



## 0 Mount the Gun up the Rear by Skids and Rollers.

### 1 PLACE SKIDS. HOOK TACKLES.

8, 9, 10 and 11 place the long skids, the upper ends bevels up, resting on the breast transom, the lower ends on the ground under the muzzle of the gun. 8 passes a handspike through the breech loop to 9. If there is none, steadying handspikes must be lashed in the usual way. 11 places a selvagee over the neck of the cascable. 12 and 13 hook the double blocks to it. 10 places a selvagee in front of the carriage, 10 and 11 hook the single blocks to it. 6 and 7 scotch the trucks and place a 24" roller on the skids ready to receive the muzzle when it dips.

### " TAUT. HEAVE.

The Nos. heave on the tackles, and when the gun is nearly high enough, a 4" skid is laid across the trunnion holes; 2 and 3 then each place a handspike in the bore, double manned by 4 and 5, so as to lift or bear down the muzzle if required.

### " REMOVE SKIDS. UNHOOK TACKLES.

### " PREPARE TO BEAR DOWN. BEAR DOWN. COME UP.

*The gun is then lowered into the trunnion holes.*

### " ARRANGE STORES.

#### TO DISMOUNT THE GUN.

## 0 Dismount the Gun Down the Rear by Skids and Rollers.

### 1 RAISE THE GUN OUT OF THE TRUNNION HOLES.

### " PREPARE TO BEAR DOWN. BEAR DOWN. COME UP.

A 4" skid is placed on the top steps.

### " PREPARE TO LIFT. LIFT. LOWER.

A 4" skid is placed in each trunnion hole.

### " PREPARE TO BEAR DOWN. BEAR DOWN. COME UP.

### " PREPARE TO LIFT. LIFT. LOWER.

### " PLACE SKIDS. HOOK TACKLES.

18 and 19 take a turn with the running ends of the tackles round the front axletree arms.

### " BEAR DOWN THE MUZZLE.

A 14" roller is placed under the gun as near the centre of gravity as possible, and a 24" roller on the skids ready to receive the breech.

**1 RAISE THE MUZZLE. EASE OFF.**

18 and 19 ease off the tackle until the breech dips on to the 24" roller.

The Nos. then man the tackles and ease off until the gun is nearly at the bottom of the skids, when 6 and 7 place a ground roller to receive it, 11 fastens a drag rope to the breech.

As soon as the gun takes the ground roller the Nos. above 10 quit the tackles and man the drag ropes, and the gun is hauled to the rear, until it rests with its centre of gravity on the ground roller.

**" REMOVE SKIDS. UNHOOK TACKLES.**

If it is intended that the gun should remain dismounted it will be placed on skids and scotched.

**" ARRANGE STORES.****0 Replace Stores.****1 REPLACE STORES.****TO MOUNT OR DISMOUNT A 64PR. GUN BY WATERED SKIDS UP OR DOWN THE REAR.**

Stores required:

2, 3, 4 and 5, handspike each.

6 and 7, 3 skids, 3'x4"x4", 12 scotches, 1 ground roller 6"x3", water bucket filled and brush.

8 and 9, 4 lashings, 1½ inch, 3 fathoms each.

8, 9, 10 and 11, two long skids 14'x8"x8", two planks, oak, half, 4'x12"x3", two planks, fir, whole, 10'x17"x3".

10 and 11, two heavy drag ropes.

12 and 13, two luff tackles, two selvagees.

12, 13, 14 and 15, handspike each.

The gun is first raised out of the trunnion holes as already described, till the trunnions rest on a 4 inch piece in each trunnion hole. The stores are arranged and the commands given as before detailed for that operation.

**1 PLACE SKIDS MAKE FAST BREECH DRAG ROPE.**

8, 9, 10 and 11 place the 14 ft. skids with the lower ends bevel down, resting on a 4 ft. oak plank, the upper ends, bevel up, on the front transom of the carriage.

6, 7, 8 and 9 launch the skids up as far as possible and fasten the lashing ropes to the rope grummetts on the outside at the upper ends of the skids. They pass the lashing ropes out to the front between the cheeks of the carriage, then back on the outside and through the eyebolts several times, and finally frap them to get in the slack. They lash the skids through the grummetts at the lower ends and cradle them by jamming large scotches under the ends from the outside. The skids are then well watered.

6 and 7 place the ground roller, to receive the breech of the gun as it quits the long skids.

11 makes fast a drag rope to the cascable.

#### **1 ON THE BREECH ROPE.**

2 and 3 apply their handspikes, double manned by 4 and 5, over the front of the cheeks of the carriage to start the gun.

The Nos. below 7 man the breech drag rope.

#### **" TAUT. HEAVE.**

The gun is hauled on to the ground roller, which is attended to by 6 and 7.

#### **" CAST OFF BREECH DRAG ROPE. REMOVE LONG SKIDS. ARRANGE STORES.**

### **TO MOUNT THE GUN.**

The gun is lying on a ground roller, supported by planks. The detachment takes post for exercise.

#### **0 Mount the Gun up the Rear by Watered Skids. Arrange Stores.**

##### **1 ARRANGE STORES.**

The stores are brought up as before detailed.

##### **" PLACE THE CARRIAGE.**

This is done by 2, 3, 4 and 5 if necessary, and large scotches are jammed under the rear axletree by 6 and 7.

##### **" PLACE SKIDS. HOOK TACKLES.**

8, 9, 10 and 11 place the skids as before, but as low as possible, allowing the upper ends to bear on the front transoms. 6, 7, 8 and 9 secure the lashing ropes to the grummetts on the outside, at the upper ends of the skids, pass them in rear of, and under the cheeks, through the eyebolts over the cheeks, round the check back through

the eyebolts and make fast. The lower ends are lashed and cradled as before.

10 and 11 hook the single blocks of the luff tackle into the two ends of a selvagee placed across the upper part of the breast of the carriage.

12 and 13 hook the double blocks into the two bights of a selvagee put over the cascable.

**1 TAUT. HEAVE.**

The Nos. below 7 man the tackles on their own sides. 6 and 7 place the points of handspikes in the trunnion holes and the gun is hauled up until it rests upon them.

**" BEAR DOWN THE MUZZLE. COME UP.**

The muzzle is borne down and the skids and tackles cleared away by the Nos. who placed them, 6 and 7 working out their handspikes.

**" ARRANGE STORES.**

**MOUNTING AND DISMOUNTING A 64PR. GUN ON A GARRISON STANDING CARRIAGE BY PARBUCKLING OVER THE SIDE.**

The detachment consists of 19 Nos.

**0 Tell Off. Take Post for Exercise.**

**1 RIGHT TURN. DOUBLE MARCH.**

**" HALT. INWARDS TURN.**

**0 Arrange Stores.**

**1 ARRANGE STORES.**

2, 3, 4 and 5 bring a handspike (6 ft).

6 and 7 . . . . . 12 scotches, 2 skids 3'x9"x6", 2 skids, 3'x6"x6", and 3 skids 3'x4"x4".

8, 9, 10 and 11, two long fir skids 14'x8"x8".

10 and 12, heavy drag rope each.

12, 13, 14 and 15, handspike each.

12 and 13, parbuckle rope each (4½ inch).

16 and 17 assist 6 and 7.

18 and 19 assist generally.

## TO MOUNT THE GUN.

**0 Mount the Gun up the Side by Parbuckling.****I PLACE THE CARRIAGE. SCOTCH UP TRUCKS.**

The carriage is placed by 2, 3, 4 and 5, and the wheels scotched by 6 and 7. It should be parallel to the gun, 12 feet from it, trunnion holes opposite the trunnions.

**" PLACE SKIDS. FIX PARBUCKLE ROPES.**

One end of the muzzle skid is placed in front of the trunnion hole and one end of the breech skid in rear of it, bevel up, skids parallel, and perpendicular to the carriage; the ends resting on the carriage are not to project above 2 inches on the inside of the cheeks.

8 and 10 place the muzzle skids.

9 and 11 the breech skids.

12 fastens the standing end of the muzzle parbuckle rope to the fore axletree.

13 fastens the standing end of the breech parbuckle rope to the eyebolt farthest from the gun, 6 and 7 pass the running ends over the carriage and under and around the gun, passing them back to 12 and 13, 6 places a 6"x9" on its edge in the trunnion holes, 7 a 6"x9" on its flat and a 4" piece over it, on upper step of carriage.

**" TAUT.**

2 and 3 apply their handspikes under the gun to roll it on to the skids, the other Nos. man the ropes, even Nos. on muzzle, odd Nos. on breech.

**" HEAVE.**

The Nos. heave until the breech is so far forward that the shoulder of the trunnion will not catch against the skid.

**" HALT. FORWARD THE MUZZLE.**

2 and 3 place their handspikes in the bore to get the muzzle forward, the muzzle parbuckle rope being hauled on at the same time.

**" PINCH BACK THE BREECH.**

3 shifts to the other side and pinches back the breech, the breech parbuckle rope being eased off.

**" HEAVE.**

The command to heave is repeated until the gun arrives at the top of the skids, when the trunnions ought to be opposite the trunnion holes.

## ARTILLERY DRILL.

The gun is now pinched or allowed to roll on to the short skids, scotches are to be placed previously to prevent the gun rolling over.

- 1 REMOVE SKIDS. OFF PARBUCKLE ROPES.
- " PREPARE TO BEAR DOWN. BEAR DOWN. COME UP.
- " PREPARE TO LIFT. LIFT. LOWER.

*The gun is lowered into the trunnion holes.*

- " ARRANGE STORES.

TO DISMOUNT THE GUN.

### 0 Dismount the Gun Down the Side by Parbuckling.

- 1 RAISE THE GUN OUT OF THE TRUNNION HOLES.

- " PREPARE TO LIFT. LIFT. LOWER.

In parbuckling down 7 places two 6"x9" on their flat on the top step.

- " PREPARE TO BEAR DOWN. BEAR DOWN. COME UP.
- " PREPARE TO LIFT. LIFT (*and slew*). LOWER.
- " SCOTCH UP. PLACE SKIDS. FIX PARBUCKLE ROPES.

The ropes should be passed over and back under the gun.

- " OUT SCOTCHES. EASE OFF. PINCH DOWN THE MUZZLE.

*The gun is then lowered on to two skids.*

- " HALT. SCOTCH UP.
- " REMOVE SKIDS. OFF PARBUCKLE ROPES.
- " ARRANGE STORES.

### TRIANGLE GYN DRILL.

The 16 ft. gyn weighs 9 cwt. and lifts 70 cwt.; 18 ft. light gyn weighs 16 cwt. and lifts 7 tons; 18 ft. heavy gyn weighs 28 cwt. and lifts 12 tons. Gyns give a mechanical advantage of 19 to 1 independent of the tackle.

The following are the main points to be attended to in working with gyns: The prypole is always considered to be the front. The gyn should be placed with its head over the centre of gravity of the weight to be lifted. All three feet should be on the same level. The foot of the prypole should be equi-distant from the feet of both cheeks.

The splay of a gyn is measured from the foot of the prypole to a point vertically beneath the windlass. The maximum

splay allowed for gyns are: 18 feet heavy, 15 feet; 18 feet light, 13 feet; 16 feet, 12 feet. Great care should be taken in preserving the splay of a gyn.

The detachment consists of 13 Nos.

### **0 Tell Off. Take Post on the Gyn.**

#### **1 TAKE POST ON THE GYN. RIGHT TURN. DOUBLE MARCH.**

2 and 3 halt one pace from the cheeks, the other Nos. one pace from each other.

### **GENERAL DUTIES.**

No. 1 Commands.

No. 2 Has charge of the right lever.

No. 3 Has charge of the left lever.

No. 4 Assists 2 at the lever.

No. 5 Assists 3 at the lever.

No. 6 Passes the fall round the windlass, holds on to it, makes it fast, eases it off, and lowers the gun.

No. 7 Assists 6 to pass the fall round the windlass, holds on next to him.

No. 8 Holds on the fall behind 6.

No. 9 Holds on the fall behind 7 and coils it down.

No. 10 Reeves and unreeves the lower block, assists in slinging and steadying the gun.

No. 11 Reeves and unreeves the upper block, assists in slinging and steadying the gun.

No. 12 assists 2 and 4 to work the lever.

No. 13 assists 3 and 5 to work the lever.

### **3 Arrange Stores.**

#### **1 ARRANGE STORES.**

1 brings a hammer and piece of spun yarn.

2 and 3, each a gyn lever and handspike.

4 and 5, each a 4' handspike.

6 and 7, three gyn trucks, spade and pickaxe, if required.

8 and 9, two heavy drag ropes each.

10 and 11, set of tackle, i.e. two Bothway blocks and 3½" or 4" fall, 15 or 18 fathoms long.

12 and 13, gun sling according to the gun.



The stores are laid down near the places where they will be required, viz.: The levers and handspikes to the right and left of the feet of the cheeks of the gyn, points to the front, the trucks where the feet are to stand, the tackle on the right, the upper block in line with the head of the gyn, the lower one in line with the upper cross bar, the fall on the right neatly coiled down and free to run, the sling and drag ropes near the weight to be lifted.

## 0 Put the Gyn Together.

### 1 PUT THE GYN TOGETHER.

2 and 3 unship the cross bars, 6, 12, 7 and 13 place the windlass, 8 and 9 withdraw the prypole bolt, 4 holds up the right cheek, 9 prypole, 5 shackle, 8 passes the bolt through them; 5 then raises the left cheek, 8 passes the bolt through it, 9 replaces the key.

### " PLACE THE WINDLASS.

6, 7, 12 and 13 place the windlass.

### " PREPARE TO RAISE.

1 bends two drag ropes together, makes one end fast below the prypole ring, takes two turns round the windlass with the other; 2 and 3 place a handspike under the lower cross bar; 4, 5, 6, 7, 12 and 13 stand to the cheeks near the head; 8 passes a handspike through prypole ring to 9, their backs to top of gyn.

### " LIFT. HOOK THE TACKLE.

The head of the gyn is lifted on to a piece of skidding. 11 hooks the upper block assisted by 10. 10 brings the lower block under the gyn and hooks it to the upper cross bar.

### " RAISE. HALT.

All the Nos. except 1, 2 and 3, lift.

### " PLACE THE GYN.

The Nos. face outwards.

### " CHEEKS IN (*Out, Right or Left*).

### " LIFT. HALT.

### " PRYPOLE IN (*Out, Right or Left*).

In carrying the cheeks or prypole the Nos. face in the direction in which it is to be carried.

### " LIFT. 7.

**1 CARRY THE GYN TO THE RIGHT, (*Left, Front or Rear*)**

The prypole Nos. turn to the windlass, those at the windlass in the direction the gyn is to be carried.

**" LIFT. HALT.****" PASS THE FALL ROUND THE WINDLASS AND SLING THE GUN.**

2 and 3 attend to the sockets, 6 and 7 pass the fall four times round the windlass to the right, when the fall comes from the left of the upper block; 6, 7, 8 and 9 hold on to the running end, 10 and 11 overhaul the tackle, sling the gun, and fix steadying ropes.

**" HEAVE IN THE SLACK.**

The slack is hauled in, 2 and 3 work the sockets.

**" SHIFT THE FALL. WORK LEVERS.**

2 and 3 insert the levers in the sockets, and assisted by 4, 5, 12 and 13, work them.

**" STOPPER AND SHIFT THE FALL.**

6 holds on; 8 and 9 pass the running end of the fall three times round the foot of the cheek farthest from the end of the windlass on which the turns are, then bring the end up in rear of the cross bar in front of the windlass, and hand the end to 2 and 3, who make a stopper hitch on the fall above the windlass, 8 and 9 haul in the slack and hold well on. 6 eases off.

**" UNSTOPPER. HIGH ENOUGH. OUT LEVERS. MAKE FAST.**

2 and 3 withdraw their levers; 7, 8 and 9 let go the fall; 6 and 7 make fast.

**" PREPARE TO LOWER OFF ROUND THE WINDLASS.**

6 casts off his hitch and with 7 holds on.

**" LOWER. OVERHAUL AND UNSLING.****" PREPARE TO STRIKE THE GYN.****" STRIKE THE GYN. UNHOOK TACKLE.****" TAKE THE GYN TO PIECES.**

The Nos. who put the gyn together assist in taking it to pieces.

# MANUAL EXERCISE FOR SHORT RIFLE.

BY NUMBERS.

## I.

*The Order.*—The recruit will first fall in in single rank. The rifle will then be placed perpendicularly at his right side, the butt on the ground, its toe in line with the toe of the right foot. The right arm to be slightly bent; the right hand to seize the rifle between the bands, thumb pressed against the thigh, fingers slanting towards the ground. When the rifle has been properly placed at "The Order," the recruit will be instructed always to fall in on parade, or for drill, with it in that position.

## II.

### THE SHOULDER FROM THE ORDER.

*Shoulder-Arms.*—Give the rifle a cant upwards with the right hand, catching it with the left hand in line with the elbow; at the same time seize the guard, at the full extent of the arm, with the forefinger and thumb of the right hand, the remaining fingers extended under the hammer; the upper part of the barrel to rest in the hollow of the shoulder.

*Two.*—Drop the left hand to the side.

## III.

### PRESENT ARMS.

*Present-Arms.*—Seize the rifle with the left hand at the lower band, raising it a few inches by slightly bending the right arm, without moving the barrel from the shoulder; then slip the thumb of the right hand under the hammer, and the fingers under the guard, slanting downwards; both arms close to the body.

*Two.*—Without moving the head, raise the rifle with the right hand perpendicularly in front of the centre of the body, guard to the left; at the same time place the left hand smartly on the stock, the wrist on the guard, fingers pointing upwards, thumb close to the forefinger (its point in line with the mouth); the left elbow to be close to the butt, the right elbow and butt close to the body.

*Three.*—Bring the rifle down close in front of the centre of the body, guard to the front, as low as the right hand will admit without constraint, and grasp it with the left hand, the little finger touching the projection in front of the lock-plate, thumb

between stock and barrel; the right hand lightly holding the small of the butt, fingers slanting downwards; at the same time place the hollow of the right foot against the left heel, both knees straight. The weight of the rifle to be supported by the left hand.

## IV.

## THE SHOULDER FROM THE PRESENT ARMS.

*Shoulder-Arms.*—Bring the rifle to the right side, and seize it with the right hand at "The Shoulder" (No. II), the left hand remaining to steady it to its place, arm close to the body; at the same time bring the right foot to its original position.

*Two.*—Drop the left hand to the side.

## V.

## THE SUPPORT.

*Support-Arms.*—Bring the butt across, till the guard is in front of the centre of the body, back of the hand to the front, the barrel resting on the right arm, crossing the point of the shoulder; and place the left hand on the right.

## VI.

## THE SHOULDER FROM THE SUPPORT.

*Shoulder-Arms.*—Bring the rifle to "The Shoulder" (No. II), and at the same time drop the left hand to the side.

## VII.

## THE ORDER FROM THE SHOULDER.

*Order-Arms.*—Seize the rifle with the left hand, little finger in line with the point of the right shoulder, arm close to the body.

*Two.*—Bring the rifle down in the left hand nearly to the ground, keeping the arm and rifle close to the body; then seize it with the right hand between the bands as described in "The Order," and place the butt quietly on the ground, dropping the left hand at the same time to the side.

## VIII.

## FIXING BAYONETS.

*Fix-Bayonets.*—Seize the socket of the bayonet with the left hand, knuckles to the front, thumb to the rear, fingers pointing to the ground, left elbow to the rear; push the muzzle of the rifle a little forward; at the same time draw the bayonet, and as soon as the point clears the scabbard turn it up, keeping the elbow down and the upper part of the arm close to the body. Place the socket of the bayonet on the muzzle (flat part of the blade to the front), and when it falls on the foresight

## ARTILLERY DRILL.

turn it with the thumb from left to right, and press it home; then turn the locking ring in the same direction, and come to "The Order."

## IX.

*Shoulder-Arms.* Two. — As detailed in No. II.

## X.

## THE PORT.

*Port-Arms.* — Seize the rifle as in the first motion of "The Present Arms" (No. III).

*Two.* — Bring the rifle to a slanting position in front of the body, guard to the left and downwards, the barrel crossing opposite the point of the left shoulder, and seize it at the same time with the thumb and fingers of the right hand round the small of the butt, the thumb and fingers of the left hand remaining round the rifle close in front of the back-sight; the left wrist to be opposite the left breast, both elbows close to the body.

## XI.

## THE CHARGE.

*As a Front Rank, Charge-Bayonets.* — Turning on the heels, point the right foot to the right, the left full to the front, and bring the rifle to nearly a horizontal position at the right side, with the muzzle inclining a little upwards; the right wrist to rest against the hollow of the thigh below the hip, the right hand to grasp the small of the butt, the thumb and fingers of the left hand to be round the rifle.

*As a Rear Rank, Charge-Bayonets.* — Remain steady at the "Port."

## XII.

## THE SHOULDER FROM THE CHARGE AS A FRONT RANK.

*Shoulder-Arms* — Raise the rifle to a perpendicular position at the right side, and seize it with the right hand at "The Shoulder" (No. II), turning at the same time to the front; the left hand remaining in its place, arm close to the body.

*Two.* — Drop the left hand to the side.

*The Shoulder from the Port as a Rear Rank. Shoulder-Arms.* — Bring the rifle with the left hand to the right side, and seize it with the right hand at "The Shoulder" (No. II), the left hand remaining in its place, arm close to the body.

*Two.* — Drop the left hand to the side.

## XIII.

## THE SLOPE FROM THE SHOULDER.

*Shoulder-Arms.*—Seize the rifle as in the first motion of “The Present Arms” (No. III).

*Two.*—Carry the rifle on to the left shoulder, and seize it with the left hand, the first two joints of the fingers grasping the inside of the butt, the forefinger half an inch from the heel, the thumb in front of the heel, the muzzle slanting to the rear, and the guard pressed gently against the hollow of the shoulder. The upper part of the left arm to be close to the side, the lower part of the arm to be horizontal, the toe of the butt to point to the centre of the left thigh; the right hand holding the small of the butt, thumb and fingers round the stock, arm close in to the body.

*Three.*—Drop the right hand to the side.

## XIV.

## THE SHOULDER FROM THE SLOPE.

*Shoulder-Arms.*—Seize the small of the butt with the right hand, fingers and thumb round the stock, arm close in to the body.

*Two.*—Bring the rifle to the right side, and seize it with the right hand at “The Shoulder” (No. II); the left hand to seize the rifle close above the lower band to steady it to the shoulder.

*Three.*—Drop the left hand to the side.

## XV.

*Order-Arms. Two.*—As detailed in No. VII.

## XVI.

## UNFIXING BAYONETS.

*Unfix-Bayonets.*—Place the rifle between the knees, guard to the front, and, seizing it with the left hand under the top band, with the second joint of the forefinger of the right hand turn the locking ring to the left; then extend the fingers under the bend, raise the bayonet, turn it to the left, and remove it from the muzzle. Drop the point of the bayonet towards the scabbard, bend resting on thumb, little finger on the top of the socket; at the same time seize the scabbard with the left hand, and guide the bayonet into it, glancing the eyes to the left in so doing. Lastly, seize the rifle with the right hand be-



## ARTILLERY DRILL.

tween the bands, and taking the time from the right, come to "The Order."

Of the foregoing motions, Nos. IV.—XVI. are performed in the "Review Exercise."

## XVII.

## THE SLOPE FROM THE ORDER.

*Slope-Arms.*—Give the rifle a cant upwards with the right hand, and seize it at the lower band; then carry it to the left side and seize the butt with the left hand, the first two joints of the fingers grasping the inside of the butt, the forefinger half an inch from the heel, the thumb in front of the heel; at the same time drop the right hand to the side.

*Two.*—Raise the rifle until the guard presses gently against the hollow of the shoulder, muzzle to point to the rear.

## XVIII.

## THE ORDER FROM THE SLOPE.

*Order-Arms.*—Drop the left arm to its full extent, and seize the rifle with the right hand between the bands.

*Two.*—Carry the rifle to the right side and come to "The Order."

## XIX.

## THE TRAIL FROM THE ORDER.

*Trail-Arms.*—Give the rifle a sharp cant upwards with the right hand, seizing it at the backsight, and bring it to a horizontal position at the full extent of the arm, fingers and thumb round the rifle.

## XX.

## THE SHOULDER FROM THE TRAIL.

*Shoulder-Arms.*—Tightening the grasp of the right hand, bring the rifle to a perpendicular position, and seize it with the left hand close above the lower band, at the same time raising it slightly, and holding it at "The Shoulder" (No. II).

*Two.*—Drop the left hand to the side.

## XXI.

## THE TRAIL FROM THE SHOULDER.

*Trail-Arms.*—Seize the rifle with the left hand, little finger in line with the right elbow, arm close to the body.

*Two.*—Seize the rifle with the right hand at the backsight; then bring it down to "The Trail," at the same time dropping the left hand to the side.



## XXII.

### THE ORDER FROM THE TRAIL.

*Order-Arms.*—Raising the muzzle, catch the rifle between the bands, and come to "The Order."

Arms must never be trailed with fixed bayonets, except by the front rank before charging.

In the foregoing exercises, great care must be taken to preserve the squareness of the body, and to avoid raising or sinking either shoulder.

\* \* \* \* \*

## XXVII.

### GROUND ARMS.

*Ground-Arms.*—Turn the rifle on the heel, guard to the right, sink the body, bending both knees, and place the rifle flat on the ground, guard to the right, muzzle inclining to the right front, hammer in line with the heels; rise at once, and return to the position of *Attention*.

## XXVIII.

*Take up-Arms.*—Sink the body as in grounding arms, take up the rifle, and come to "The Order."

## XXIX.

*The Short Trail.*—Raise the rifle from the ground, keeping the barrel close to the shoulder.

## XXX.

### STAND AT EASE FROM THE ORDER.

*Stand-at-Ease.*—Push the muzzle of the rifle to the front with the right hand, arm close to the side; at the same time carry back the right foot six inches and slightly bend the left knee.

*The Secure.*—For the protection of the rifle in wet weather, the soldier may carry it as follows:—The rifle to be under the left arm, butt to the rear, the hammer to be close up under the armpit, the barrel slanting downwards and inclining to the left front; the rifle to be firmly grasped with the right hand, which is to be rather lower than the hip; the right elbow a little to the rear. On the word *Change Arms*, the rifle to be carried under the right arm in a like manner.

The batteries armed with the short rifle and swords will substitute the following for Secs. VIII. and XVI:

## VIII.

## FIXING SWORDS.

*Fix-Swords.*—Place the rifle between the knees, guard to the front, and at the same time seize the scabbard with the left hand, turning the handle of the sword towards the right front; then seize the handle with the right hand, knuckles downwards, and draw the sword to the front; turn the point upwards when it is well clear of the body, and seize the rifle with the left hand under the upper band. Place the back part of the handle against the right side of the barrel, knuckles to the right, arm close to the body, and slide the spring on to the catch and the ring on to the muzzle; lastly, seize the rifle with the right hand between the bands, and, taking the time from the right, return to "The Order."

## XVI.

## UNFIXING SWORDS.

*Unfix-Swords.*—Place the rifle between the knees, guard to the front, and, placing the left hand on the guard of the sword, knuckles to the front, seize the handle with the right hand, knuckles to the front, fingers pointing downwards, forefinger on the spring. Tighten the knees on the rifle, press the spring, and gently raise the sword upwards; when clear of the muzzle drop the point, with the edge to the front, towards the scabbard, raising the right elbow as it falls; at the same time seize the scabbard with the left hand and guide the sword into it, glancing the eyes to the left in so doing. Lastly, seize the rifle with the right hand between the bands, and, taking the time from the right, come to "The Order."

## MOTIONS OF THE RIFLE PERFORMED ON THE MARCH.

The recruit will learn to perform the following motions of the rifle while marching; they may be taught at first while he is marking time. Each motion should be done as the left foot comes to the ground, the command being completed as the right foot comes to the ground.

When soldiers standing in line with unfixed swords step off from "The Order," they will come to "The Trail" as they take the first step;—when standing in line with swords fixed, or in files, they will come to "The Shoulder," returning in each case, to "The Order," when they halt, or halt and front;—when marching in line or to a flank in fours with trailed arms, and ordered to turn into file, or form two deep, they will come to "The Shoulder" as they turn and form, and will trail again on

turning from file into line, or forming fours; when they halt and front from file they will order.

When soldiers standing with shouldered arms receive the command *Slow (or Quick) March*, they will step off remaining at "The Shoulder;" when the word is *Double March* they will come to "The Slope."

When soldiers marching with sloped arms and unfixed swords are halted, they will come to "The Order;" when swords are fixed they will remain at "The Slope." When soldiers come to "The Shoulder" by word of command before being marched off, on halting, they will remain at "The Shoulder."

When a soldier marching with trailed arms is required to turn to the right (or left) about, he will bring his rifle to a perpendicular position by a turn of the wrist on the first pace of the turn, and will trail again on the fourth, the pace on which he steps off in the new direction;—if at "The Slope" he will bring the rifle to a perpendicular position on the first pace of the turn, and slope again on the fourth pace.

The above rules will equally apply when the soldier is ordered to mark time from the halt.

When men standing with ordered arms are directed to form fours, to close to the right or left, to step back, or to take any named number of paces to the front, they will come to "The Short Trail."

Soldiers will never be marched off from "The Order" when their arms are loaded, but will be directed to slope except when required to move at "The Shoulder."

Skirmishers and men extended, supports, and reserves, if unloaded, move at "The Trail."

#### FROM THE HALT WITH ORDERED ARMS.

*Quick-March, or Quick, Mark-Time.*—Step off (or commence marking time), bringing the rifle to "The Trail" as the first step is taken.

#### THE SHOULDER FROM THE TRAIL.

*Shoulder-Arms.*—As at the halt.

#### THE TRAIL FROM THE SHOULDER.

*Trail-Arms.*—As at the halt.

#### CHANGING ARMS AT THE TRAIL.

*Change-Arms.*—Raise the rifle to a perpendicular position at the right side, carry it to the left side and pass it into the

left hand; then lower it to "The Trail," at the same time dropping the right hand to the side.

*Change-Arms.*—Change the rifle back to the right side in a similar manner.

*Shoulder-Arms.*—As already taught.

*Slope-Arms.*—As at the halt.

#### CHANGING ARMS AT THE SLOPE.

*Change-Arms.*—Pass the left hand up quickly and seize the small of the butt, fingers and thumb round the stock; at the same time seize the butt with the right hand, first two joints of the fingers round the stock, thumb in front of the heel; raise the rifle to a perpendicular position, carry it across the body and place it on the right shoulder, then drop the left hand to the side.

*Change-Arms.*—Carry the rifle back to the left shoulder in a similar manner.

*Squad-Halt.*—Halt, and come to "The Order."

#### CHARGING.

Soldiers will be taught to charge as follows:—

*Fix-Swords.*—As already taught.

*Slope-Arms.*—As already taught.

*Quick-March.*—Step off at "The Slope."

*As a Front Rank, Prepare to Charge.*—Bring the rifle to "The Trail" without losing the square position of the body or the regularity of the step.

*Charge.*—Bring the rifle to the position of "The Charge," and break into double time.

*As a Rear Rank, Prepare to Charge.*—Remain at "The Slope."

*Charge.*—Break into double time, continuing at "The Slope."

*Squad-Halt.*—Halt; the front rank coming to "The Slope," the rear rank remaining at "The Slope."

#### FIXING SWORDS ON THE MARCH.

When soldiers marching at "The Trail" are required to fix swords, they will change the rifle into the left hand, then draw the sword with the right hand, bringing it out of the scabbard

between the left arm and the body, inclining the barrel of the rifle upwards, muzzle opposite the left breast, and fix the sword as at the halt; this done, they will come to "The Slope," and drop the right hand to the side.

If marching with sloped arms, and required to fix swords, the soldiers will bring their rifles to "The Trail;" they will then proceed as above described. Care should be taken, in fixing, not to damage the muzzle of the rifle.

If marching at "The Trail" and required to fix bayonets, soldiers will slant the muzzles of their rifles upwards, fix bayonets as at the halt, and come to "The Slope."

#### MANUAL EXERCISE FOR THE LONG AND SHORT RIFLE, IN TWO RANKS, AND PILING ARMS.

1. *Manual Exercise in Two Ranks.*—When recruits have been taught all the motions of the Manual Exercise, either singly or in squads in single rank, they will be practised in squads of two ranks.

2. *Movements Performed at Open and Close Order.*—The Manual Exercise is performed with the ranks at open order. Before troops formed in line are required to salute by presenting arms, they will take open order; but not when they salute in quarter column.

3. *Distance Between Ranks with Trailed Arms.*—When a squad in two ranks standing with ordered arms is required to step off without shouldering or sloping, the rear rank men will step short their first two paces (with the short rifle their first pace), to give sufficient room for their rifles when trailed; when ordered to trail on the march, the rear rank will step short two paces (or one pace):—when the squad is halted the rear rank will regain its distance by taking a long pace as it comes to the halt. When ordered to trail at the halt, the rear rank will step back a pace of 18 (or 9) inches, resuming its distance on coming to "The Order." When ordered to shoulder arms from "The Trail" on the march, the rear rank will lengthen its pace to regain its distance.

4. *Motions of Both Ranks the Same.*—The motions of the rifle in the Manual Exercise are performed in the same manner by both ranks, excepting in "The Charge."

#### PILING ARMS.

*Pile.*—On the word *Pile*, the rear rank will step back a pace of 9 inches, and the front rank men draw back the right foot ready to turn to the right about.

## ARTILLERY DRILL.

*Arms.*—On the word *Arms*, the front rank will turn about, bringing their rifles with them at the short trail; the whole will then place the butts of their rifles between their feet, guards to the left; after which the right file rear rank, and the left file front rank will incline their rifles towards each other, and cross rods. This done, the front rank man of the right file will with his left hand seize the rifle of the front rank man of his left file by the muzzle, bearing it from him, and with his right hand lock rods by passing his own by the left of the rods and to the right of the muzzles of the other rifles; when firmly locked, the even number front rank, seizing his rifle between the bands, will move the heel of the butt to his right front so as to form a triangle of equal sides with the other two butts; lastly, the left file rear rank will lodge his rifle between the muzzles of the rifles of the front rank, sling uppermost. When there is an odd file, each man of the file will lodge his rifle against the pile nearer his right hand.

*Stand-Clear.*—Ranks will step back a pace of nine inches, and turn to the directing flank.

*Stand-To.*—Ranks will turn inwards, and close on their arms by taking a pace of 9 inches forward.

*Unpile.*—On the word *Unpile*, seize the rifle with the right hand under the top band, the front rank men at the same time drawing back their right feet ready to turn to the right about.

*Arms.*—On the word *Arms*, the men will unlock the rods without hurry, by inclining the butts inwards, and come to "The Order." The front rank will then *front*, and the rear rank close on it by taking a pace of 9 inches forward.

In piling arms on parade, the word *Break-Off* will be given after *Stand-Clear*. On again falling in the men will place themselves as they stood before breaking off.

It is necessary to be careful in piling and unpling arms, to prevent damage being done to the rods and sights.

## PAYING COMPLIMENTS WITH ARMS.

When a non-commissioned officer, or soldier, passes or addresses an officer, he will do so at "The Shoulder," with the left arm brought across the body, and the hand, fingers extended, meeting the sling of the rifle in line with the right elbow.

## DISMISSING A COMPANY.

*Right Turn. Dismiss.*—The men will port arms, at the same time taking a side pace outwards by ranks; after a pause they will break off.



After breaking off, the men must leave the parade in a quiet and orderly manner, carrying their rifles at "The Shoulder."

FIRING EXERCISE, PRELIMINARY PRACTICE.

**Caution.**—*Preliminary Practice by Numbers, Standing.*

**Ready.**—Make a slight turn to the right on both heels, carrying the rifle round with the body; the right foot to point to the right front, *eyes to look to the front.*

**Two.**—Advance the left foot, *moving the body with it*, ten inches, to the left front, viz:—six to the front and eight to the left, toes to point to the front; at the same time, bring the rifle to a horizontal position at the right side, with the small of the butt just in front of the hip, grasping the stock with the left hand *near the point of balance*, thumb between stock and barrel, the elbow close to the body as a support for the rifle: holding the small of the butt lightly with the right hand, thumb on the comb of the hammer, and elbow to the rear, and half cock.

**Three.**—Placing the thumb of the right hand on the thumb-piece of the breech-block (the fingers closed in the hand), open the breech by a sharp turn of the wrist, take a cartridge between the forefinger and thumb, put it into the chamber, and press it home with the thumb; then close the breech, pressing the block firmly home.

**At—Yards.**—Adjust the backsight by moving the slide with the forefinger and thumb of the right hand until the top is even with the place on the leaf, or on the bed giving the elevation for the distance named, then, if necessary, raise the leaf carefully, preventing it springing up with a jerk; full cock with the thumb, fingers behind the trigger-guard, return the hand to the small of the butt and fix the eyes on the object. Thumb to point to the muzzle after cocking.

The motions are to be performed without any unnecessary movement of the rifle.

When men are required simply to load, the command will be "Load," and they will perform the first three motions of the "Ready."

Before giving the command "Present," some distance should always be named.

The instructor will be most particular as to the following points in this and, as far as they apply, in the succeeding practices, viz:—that every man holds his rifle firmly with the left hand, at the place where he is to hold it when at the "Present,"



—the small of the butt just in front of the hip—the fingers of the right hand behind the trigger-guard, body erect, left side perpendicular, right shoulder well forward, eyes fixed on the object, head in the same direction and erect, and the feet in the proper position.

When kneeling, the right foot and knee are to be in the proper position. The body is to rest firmly on the right heel.

*Present.*—Raise the rifle smartly to the front of the right shoulder, to the full extent of the left arm, the arms to move close to the body, *the backsight to be upright*, the top part of the butt plate to be in line with the top part of the shoulder, the muzzle to point towards the mark the eyes are fixed upon, the forefinger to be placed round the trigger, but without pressing it, both elbows to be inclined downwards.

The squad will be frequently brought back to the “Ready” by the command “As you were,” in order to establish the men in the proper position.

*Two.*—Bring the rifle smartly into the hollow of the right shoulder, *which must not be allowed to give way*, pressing it thereto with the left hand, and at the same time bring the *left elbow well under the rifle*, and the right elbow a little lower than and well to the front of the right shoulder to form a bed for the butt; the top part of the butt plate to be in line with the top part of the shoulder; as the butt touches the shoulder the head is to be inclined slightly forward, not sideways, and aim taken as taught in “Aiming Drill.” When kneeling, place the left elbow on the left knee, with *the forearm not inclined to one side*.

*Three.*—Bring the rifle smartly to the “Ready,” placing the forefinger at the same time behind the trigger-guard.

When the positions are properly established, the men will be exercised in the “preliminary practice,” judging the time; the commands after coming to the “Ready,” being, as a caution:—

*Preliminary Practice, Judging the Time.*

*At—Yards. Present.*—Proceed with the motions consecutively, observing a short pause between each.

*Steady.*—Return to the “Ready,” and cease the practice.

#### TO HALF-COCK ARMS WHEN AT THE “READY.”

*Half-Cock-Arms.*—Place the thumb of the right hand on the comb of the hammer, and the forefinger on the trigger, and draw both back until the sear is disengaged from the full bent of the tumbler,—then let the hammer gently down until it

passes the half bent, and (removing the forefinger from the trigger) draw it back to the half bent again,—shut down the flap of the backsight if raised,—and let the hand resume its original position.

**TO EASE SPRINGS WHEN AT THE HALF-COCK.**

*Ease-Springs.*—Place the thumb of the right hand on the comb of the hammer, and the forefinger on the trigger, and draw both back until the sear is disengaged from the half bent of the tumbler,—then let the hammer gently down (removing the forefinger from the trigger) on the nipple,—and carry the hand to its position at the “Ready.”

Springs must never be eased when a cartridge is in the chamber.

**TO ORDER ARMS FROM THE “READY,” STANDING.**

*Order-Arms.*—Turn on the right heel to the front, and bring the left foot back to the right; at the same time seize the rifle with the right hand close in front of the left and come to the “Order,” placing the butt lightly on the ground.

*Stand-at-Ease.*

**TO LOAD AND FIRE BY NUMBERS, STANDING, FROM “THE ORDER.”**

Caution,—*Firing Exercise by Numbers, Standing.*

*Ready. Two. Three.*—As before detailed.

*At—Yards.*—As before detailed.

*Present.*—Bring the rifle *at once* into the hollow of the right shoulder, carrying it to the front to clear the body in doing so, and proceed as before detailed.

*Two.*—Press the trigger without any movement of the hand, eye, or arm, until the spring is released, keeping the aim on the object.

The breathing is to be restrained while aiming and pressing the trigger.

*N. B.*—*The instructor will see that each man is able to get his aim within three pauses of slow time standing, four kneeling, and six lying down.*

*Three.*—Bring the rifle smartly to the “Ready”—open the breech, and—holding the breech-block firmly with the forefinger and thumb, by the “thumb-piece” and “nipple-lump,” draw it back as far as possible with a jerk, raising the muzzle of the rifle slightly in doing so, to remove the empty cartridge case,—let the breech-block go back, and at the same time cant the rifle sharply over to the right by a turn of the wrist, to

## ARTILLERY DRILL.

allow the case to fall out, bringing the rifle again to a horizontal position,—then close the breech, shut down the flap of the back-sight if raised, and “Ease-springs.”

When the word “Ready” is given to men at the 3rd motion of the “Present,” they will proceed with the 3rd motion of the “Ready,” and adjust sights.

Too much pains cannot be taken to ensure the soldier taking a deliberate aim at some object whenever he brings the rifle to the “Present.”

TO COME TO THE “READY” BY NUMBERS, STANDING, FROM “THE SHOULDER” OR “THE SLOPE.”

Caution,—*Firing Exercise, by Numbers, Standing.*

*From “The Shoulder,” with the Short Rifle.*

*Ready.*—Make a slight turn to the right as before detailed; at the same time seize the rifle with the left hand where it is to be held at the “Present,” bending the right arm slightly to do so.

*Two. Three.*—As detailed in the 2nd and 3rd motions of the “Ready.”

*At—Yards.*—As before detailed.

## TO UNLOAD ARMS.

*Unload-Arms.*—Half-cock and open the breech as in the 3rd motion of the “Present,” but allowing the cartridge, on being withdrawn, to fall into the hand. Return the cartridge to the pouch, and “Ease-springs.”

## TO LOAD AND FIRE IN QUICK TIME, STANDING.

The recruit having thoroughly learned the Firing Exercise by Numbers, standing, will next be taught to perform it in Quick Time, the motions being executed as before detailed, resting a short pause between each.

Caution,—*Firing Exercise, Standing.*

*Ready.*—In one motion.

*At—Yards.*—In three motions.

*Present.*—In three motions.

*Order-Arms.*—In one motion.

## TO LOAD AND FIRE, BY NUMBERS, KNEELING, FOR INFANTRY.

Caution,—*Firing Exercise, by Numbers, Kneeling.*

*Ready.*—As detailed when firing standing.

*Two.*—Bring the rifle to a horizontal position at the right side, as detailed when firing standing; at the same time sink on the right knee about twelve inches to the rear and twelve to the right of the left heel, *but so that the left heel shall be slightly in advance of, never behind the left knee*, bringing the weight of the body, *which should be firm and erect*, at once on the right heel; and place the left forearm about six inches behind the left knee; left toes to point to the front, the butt to rest against the right side.

*Three. At--Yards.*—As detailed when firing standing.

*Present.*—As detailed when firing standing, except that the left elbow is to be supported by the left knee with the *forearm not inclined to one side*.

The body is not to be raised off the heel in bringing the rifle to the shoulder.

Elevation must be got by *lowering the right shoulder; retaining the grasp of the rifle with the left hand, and the position of the elbow on the knee*.

*Two.*—As detailed when firing standing.

*Three.*—As detailed when firing standing, placing the left forearm about six inches behind the left knee.

The instructions which follow the "Present" standing apply generally to the kneeling position.

*Order-Arms.*—Spring to "*Attention*," turning on the left heel to the front, and "*Order Arms*."

#### PREPARING FOR CAVALRY.

The practice of receiving cavalry will be commenced on the march with trailed arms; on the command *Halt, or Halt, Right-About-Turn, or Rear-Turn*, the men will order arms and fix bayonets (or swords). When the movement is performed from the halt, the leading company will order and fix when the remainder get the command *Quick (or Double) March*. The men who halt without word of command will, in either case, order and fix as they halt.

*Prepare for Cavalry.*—If the square is four deep, the second and fourth ranks will take a pace of ten inches to the right front. The first and second ranks will then sink upon the right knee, but without bringing the weight of the body upon the heel, and, at the same time, place the butts of their rifles on the ground against the inside of their right knees, guard to the right, with the muzzles slanting upwards so that the point of the bayonet (or sword) may be about the height of a horse's

chest; the left hand to grasp the rifle firmly immediately above the lower band, the right hand to hold the small of the butt, the left arm to rest upon the thigh about six inches from the knee.

The third and fourth ranks will come to the "Ready" (the muzzles of the rifles to be slightly inclined upwards.)

When men standing with unfixed bayonets (or swords) are ordered to prepare for Cavalry, they will at once fix, and then proceed as above described.

If the square is required to fire, unless it is intended to fire from all faces of the square at once, the caution—*Face* (or *Faces*) will precede the caution to fire.

*Fire a Volley. Ready. At—Yards. Present. Fire.*—The third rank of each face, or of the named face (or faces), will proceed as before detailed. The fourth rank will raise the muzzles so that their rifles may point upwards at an angle of 45°, resuming the "Ready" position after firing. Any face of the square that has not been required to fire will order at the same time as the remainder.

*Kneeling Ranks* (or *Kneeling Ranks of the—Face, or Faces*) *Fire a Volley.*—This caution to be given, should it be deemed necessary for the front kneeling ranks to fire a volley.

*Ready. At—Yards.*—As before detailed; and bringing the weight of the body on the right heel.

*Present. Fire.*—As before detailed; then bring the rifle again to resist Cavalry.

*Order-Arms.*—As before detailed.

If considered expedient, the front standing and kneeling ranks may fire volleys alternately, time being allowed between the rounds for the smoke to clear away.

The above detail applies equally to squares less than four deep, with the exception that the front rank only will kneel to resist Cavalry, and the second rank will not close up.

#### A FEU-DE-JOIE.

For this mode of firing, the line will be drawn up at open order, as described in the "Infantry Drill," except that the mounted officers will take post in the rear, and that bayonets will not be fixed.

*With Blank Cartridge, Ready.*—Muzzles of rifles to slant upwards when loading, and to remain so.

*Present. Fire.*—Rifles to be elevated at an angle of 45°.

After a pause the right hand man of the front rank will commence the fire, which will run down the front and up the rear as quickly as possible. When the right hand man of the rear rank has fired, the whole will glance their eyes to the right to bring the rifle to the "Ready" position, remove the cartridge-case, &c.

*Ready. Present. Fire.*—As before directed.

The same to be repeated a third time.

*Order-Arms.*

The mounted officers will then move to the front and the commanding officer will give the following commands:—

*Fix-Bayonets. Shoulder-Arms. Royal Salute, Present-Arms. Shoulder-Arms. Order-Arms. Three Cheers. Unfix-Bayonets.*

When artillery are present and are ordered to fire 21 guns, seven will be fired before each round of the Feu-de-Joie.

## REVIEW EXERCISE.

At inspections or Reviews, the Manual and Firing Exercises will be performed in Quick Time. The men standing at "The Order," bayonets or swords unfixed, will be ordered to take open order as described in the "Infantry Drill;" after which the words of command will be as follows:—

### SHOULDER-ARMS.

Caution. **MANUAL—EXERCISE.**

- I. **PRESENT—ARMS.**
  - II. **SHOULDER—ARMS.**
  - III. **SUPPORT—ARMS.**
  - IV. **SHOULDER—ARMS.**
  - V. **ORDER—ARMS.**
  - VI. **FIX—SWORDS (OR BAYONETS.)**
  - VII. **SHOULDER—ARMS.**
  - VIII. **PORT—ARMS.**
  - IX. **CHARGE—SWORDS (OR BAYONETS.)**
  - X. **SHOULDER—ARMS.**
  - XI. **SLOPE—ARMS.**
  - XII. **SHOULDER—ARMS.**
  - XIII. **ORDER—ARMS.**
  - XIV. **UNFIX—SWORDS (OR BAYONETS.)**
- CLOSE—ORDER. MARCH.**



## ARTILLERY DRILL.

Caution. FIRING EXERCISE.

FIRE A VOLLEY. READY. AT 400 YARDS.

PRESENT. FIRE.

OR

FIRE — VOLLEYS.

READY. AT 400 YARDS. PRESENT. FIRE.

ORDER—ARMS. STAND AT—EASE.

## MANNER OF INSPECTING ARMS ON PARADE.

The Company having been inspected as directed in the "Infantry Drill," bayonets (or swords) having been unfixed, and arms shouldered, the inspecting officer will proceed as follows:—

*For Inspection. Port-Arms.*—When at "The Port," half-cock the rifle and open the breech, holding the block between the forefinger and thumb of the right hand by the thumb-piece and nipple-lump.

The officer will go down the ranks to see that the breech-shoe and breech-block are free from rust, and otherwise clean, also to see that the breech-block is free in its action. Each soldier, as the officer approaches within one file of him, will turn the barrel of his rifle full to the front with his left hand, lock downwards, and draw back the breech-block with his right hand. As the officer passes, each soldier will turn the barrel upwards, let go the breech-block, and seize the small of the butt with the right hand, thumb pointing to the muzzle.

*Close Order—March.*

*Examine-Arms.*—On the word *Examine* the rear rank will take a pace of ten inches to the right front.

On the word *Arms* both ranks will come to "The Ready," (1st and 2nd motions), with the muzzle of the rifle so inclined as to enable the officer to look through the barrel.

The officer will now proceed to look through each barrel to see that it is clean and free from rust. The soldier, when the officer passes the file nearest to him, will close the breech, ease springs, order arms, resume his distance if a rear-rank man, and stand at ease.

## RIFLE EXERCISES FOR SERGEANTS.

Sergeants, when moving with their companies or with the battalion, will remain with unfixed swords, except when the men fix for defence against cavalry, in which case they will have their swords fixed.

Sergeants will stand at ease and come to attention with the men; they will also shoulder arms, slope (or trail) arms, and order arms with them. The sergeants, during the performance of the Manual and Firing Exercises by the rank and file, will remain steady at "The Shoulder," during the Bayonet Review Exercise at "The Order."

*Recover-Arms.*—Sergeants will recover arms as follows:—Seize the rifle as directed in the first motion of "The Present Arms," then raise it perpendicularly in front of the face, right hand grasping the small of the butt, thumb as high as the mouth, barrel to the front; at the same time place the left hand under the butt, thumb in front of the heel, first two joints of the fingers round the side of the butt.

While a sergeant marking a point in a line formation is extending an arm, he will hold his rifle by the small of the butt with the other hand, resting the toe against his chest.

#### GUARDS AND SENTRIES.

Guards, reliefs, rounds and patrols will march with sloped arms and unfixed bayonets, except in wet weather, when they will march at "The secure." Reliefs marching with sloped arms will shoulder when at 10 paces from the sentry, and slope again when at 10 paces after relieving.

Sentries are to walk about with their arms either shouldered or sloped. If moving at "The Slope" they will not necessarily shoulder as they turn about at each end of their walk, but may remain at "The Slope." In corps armed with the short rifle, sentries are permitted to support arms when at the halt, and to move at the "Sling" or "Trail."

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## GUNNERY.

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*Calibre.*—The diameter of the bore in inches. In rifled guns it is measured across the lands.

*Axis of the Piece.*—An imaginary line passing through the centre of the bore.

*Axis of the Trunnions.*—An imaginary line passing through the centre of the trunnions.

*Windage.*—The difference between the sectional area of the bore through the grooves, and that of the projectile through the studs, gas checks or driving bands. With B. L. guns there is practically no windage.

*Trajectory.*—The curve described by the projectile in passing from the muzzle to the first point of impact.

*Range*—The distance between the gun and the object fired at.

*Line of Sight.*—A line passing through the sights of the piece and the object aimed at.

*Line of Fire.*—A line joining the muzzle of the piece and the point aimed at. This term would be used instead of the preceding one if firing from behind cover, or in any case when the sights of the piece are not used.

*Plane of Sight.*—The vertical plane passing through the line of sight.

*Angle of Sight.*—The angle which the line of sight makes with the horizontal plane.

*Angle of Elevation.*—The angle which the line of sight makes with the axis of the piece.

*Quadrant Angle.*—The angle which the axis of the piece makes with the horizontal plane.

It is termed *quadrant elevation* or *depression* according as the piece is laid above or below the horizontal plane.

**NOTE.**—The angle of elevation and the quadrant angle are the same when the line of sight is horizontal.

*Line of Departure.*—The direction of the projectile on leaving the muzzle; in other words, a tangent to the trajectory at the muzzle.

*Plane of Departure.*—The vertical plane passing through the line of departure.

*Angle of Departure.*—The angle between the line of departure and the horizontal plane.

*Jump.*—The angle between the line of departure and the axis of the piece before firing.

**NOTE.**—Jump arises from the gun and carriage revolving in a vertical plane on their points of support in rear when the gun is fired and takes effect before the projectile leaves the bore. With no jump the line of departure and the axis of the piece before firing would be identical.

*Angle of Descent.*—The angle which a tangent to the trajectory at the first point of impact makes with the horizontal plane.

*Angle of Incidence.*—The angle which a tangent to the trajectory at the point of impact makes with the surface struck. It may be considered either vertically or horizontally.

*Lateral Deviation.*—The perpendicular distance of the point of impact of the projectile right or left of the plane of sight.

*Dispart.*—Is half the difference between the diameters of those parts of the gun upon which the sights are placed.

*Drift.*—The constant deflection of the projectile from the plane of departure due to the rotation imparted by the rifling of the piece. The rifling in all British guns being right handed causes the projectile always to deflect to the right. This is compensated for in the 64pr. and 49pr. guns by setting the tangent scales at an angle of  $2^{\circ} 16'$  to the left.

*Preponderance.*—The excess of weight of the gun in rear of the trunnions over that in front.

*Point Blank.*—A gun is laid point blank when the line of sight is parallel to its axis. Point blank range is the range due to the jump of the gun.

*Muzzle Velocity.*—The velocity in feet per second with which a projectile leaves the muzzle.

*Remaining Velocity.*—The velocity of a projectile at any given point of its trajectory.

*Striking Velocity.*—The velocity of a projectile at the point of impact.

The following are the natures of artillery fire:—

#### WITH REFERENCE TO THE VERTICAL PLANE.

*Direct Fire.*—Fire from guns with service charges at all angles of elevation not exceeding  $15^{\circ}$ .

*Indirect or Curved Fire.*—Fire from guns with reduced charges, and from howitzers and mortars at all angles of elevation not exceeding  $15^{\circ}$ .

*High Angle Fire.*—Fire from guns, howitzers and mortars at all angles of elevation exceeding  $15^{\circ}$ .

#### WITH REFERENCE TO THE HORIZONTAL PLANE.

*Frontal Fire.*—The line of fire perpendicular to the front of the object fired at.

*Oblique Fire.*—The line of fire inclined to the front of the object fired at.

*Enfilade Fire.*—The line of fire parallel (or nearly so) to the front of the object aimed at.

*Reverse Fire.*—When the rear instead of the front of the object is fired at, as when the gun is in rear of the enemy.

## THE GUN.

The object of rifling a gun is to (a) increase its accuracy, (b) to enable an elongated projectile to be used.

As the rifling gives a definite rotation to a projectile its lateral deviation is constant and can be allowed for, thus increasing the accuracy of the gun.

The advantages of an elongated projectile are: 1. Less resistance of air, because of smaller head for same weight. 2. Flatter trajectory. 3. Head may be of any form or weight. 4. By varying the length different projectiles may be made of the same weight. 5. Double shell may be used, which are specially heavy. 6. Capacity of shell is increased. 7. A shell of the same weight as that of the S. B. gun can be fired from a much lighter gun, or a heavier shell from a gun of the same weight.

The systems of rifling now in the service are:—

(a). The R. B. L. Polygroove (original Armstrong). Rotation given by soft metal coating being forced into a large number of grooves with sharp corners. Ex.: 40pr. R. B. L. gun.

(b). The R. M. L. old Woolwich system, having a few broad deep grooves. Rotation imparted by means of soft metal studs fitted to correspond with the grooves, or in studless projectiles, by gas checks, which take the rifling. Ex.: 64pr. R. M. L. gun.

(c). The R. M. L. and B. L. modern Polygroove. Rotation given in the former by gas checks, in the latter by driving bands which are forced into a large number of shallow and rounded grooves. Ex.: All modern R. M. L. and B. L. guns.

## THE PROJECTILE.

The forces acting on a projectile in the bore of a gun are: (a) the force of projection of the powder-gas, (b) the rotation imparted to the projectile by the grooves.

The forces acting on a projectile during flight are: (a) the force of projection, (b) the force of gravity, (c) the resistance of the air, (d) the rotation due to rifling.

The variable forces acting on a projectile are: (a) varying effect of the charge because of incorrect weighing, variation of strength of powder, resistance of the air, or difference of space occupied by cartridge in the bore, (b) difference of level of trunnions, (c) force and direction of wind.

## USE OF PROJECTILE.

Common shell are used to destroy the *personnel* and *materiel* of the enemy, by bursting them close up to the

troops, or in the head of a column, using them as a mine against earthworks, and by obtaining direct hits against guns and limbers. They are also used with direct, curved, and high angle fire, to destroy ships and earthworks, masonry and overhead cover. Use generally Percussion fuzes.

*Shrapnel Shell* should be burst close up to formations having great depth with very narrow front, further off against a formation having breadth and depth, and still further off against an extended front with no depth.

#### GENERAL RULES FOR LAYING ORDNANCE.

1. See that the tangent and deflection scales are set and clamped at the elevation and deflection required.
2. To avoid wearying the eye, get the gun laid approximately for elevation and direction before carefully looking over the sights, then lay quickly.
3. Lay over the object and then depress on to it, thereby avoiding error due to the play of the elevating gear.
4. Choose a clearly defined part of the target to lay on, and always lay on the same point from round to round. All corrections and allowances should be made by adjusting the proper scales and not by laying off the target.
5. The distance of the eye from the hind sight should on no account be varied, but be the same from round to round.
6. Let the words of command be a guide to the numbers elevating and traversing, giving them loud or low, as the gun requires to be moved much or little.

#### GUNNERY RULES.

##### *For Obtaining Elevation.*

| Up to 500 yds., |   | 10 yds., — 1 minute elevation. |   |     |     |
|-----------------|---|--------------------------------|---|-----|-----|
| 500 to 1000     | " | 7                              | " | — 1 | " " |
| 1000 to 1500    | " | 6                              | " | — 1 | " " |
| 1500 to 2000    | " | 5                              | " | — 1 | " " |
| 2000 to 2500    | " | 4                              | " | — 1 | " " |

*For Correcting Deflection.*—Divide the error in inches by hundreds of yards in range to obtain minutes of deflection. If the range is 1800 yards, error 6 feet to right of the object, the deflection will be 4 minutes to the left. For 6 feet, which equals 72 inches, divided by 18, the number of hundreds of yards in the range, gives 4, the number of minutes of deflec-



tion to the left. To carry the projectile more to the left move the deflection scale to the left. To carry to right move scale to right.

*One Wheel or Trunnion High.*—The projectile tends towards the lowest wheel or trunnion. To correct this, find difference in level of wheels or trunnions in inches and multiply by the degrees of elevation, which will give the required difference towards the highest wheels or trunnion in minutes. Example: Right wheel two inches lower than the left, firing with  $3^{\circ}$  of elevation. 3 multiplied by 2 will give 6 minutes left deflection.

*Range by Depression.*—For high batteries where no range finder is available, height of gun in feet, multiplied by 1146, divided by number of minutes in angle of depression gives range in yards. The angle of depression can be obtained by the quadrant.

*For Boring Fuzes.*—For common shell, divide hundreds of yards of range by 2, and add 1 up to 1000, 2 up to 2000, and so on. For shrapnel, as above; but add nothing for the first 1000, 1 for second 1000 yards, and so on.

## AMMUNITION.

*Ammunition* includes every description of projectile fired from all natures of ordnance and the means of firing the same.

*Gunpowder* is an intimate mechanical mixture of saltpetre, 75 parts; charcoal, 15 parts; and sulphur, 10 parts. The sulphur enables it to ignite at a low temperature; the charcoal retards the rate of burning, and the decomposition of the saltpetre liberates a large volume of gas. It explodes at 600° Fahr.

*Classification.*—The classes of powder are: 1. Service, including all new powder; 2. Blank, including all powder which being slightly deteriorated is only fit for salutes and exercise; 3. Shell, or powder too dusty for class 2.

*Natures.*—The nature of powder used at this station with rifled ordnance is R. L. G<sup>2</sup>. This is highly glazed and dense powder of 3 to 6 mesh. R. L. G. and L. G. may be used until the supply is exhausted. R. F. G<sup>2</sup>., R. F. G. and F. G. is used for busters of shrapnel shell. Blank R. L. G. or L. G. is used for saluting charges. R. F. G., 12 to 20 mesh, is used in Snider cartridges.

*Cartridges* for 64pr. R. M. L. guns are made of silk cloth, formerly of serge, painted in black with the nature of gun and weight of charge. Contain 6 lbs. R. L. G<sup>2</sup>., R. L. G. or L. G. reduced charge; or 5 lbs. R. L. G. or L. G. blank for saluting charge. The cartridges are choked by drawing the mouth together into plaits with a brass needle threaded with two strands of silk twist; three turns are taken round the choke and the needle passed three times through the choke and below the strands. The needle is then turned down through the powder and out at the seam in line for the front hoop, the twist is then carried round the cartridge and stitched down at two or three points. The remainder of the hoops are similarly formed. Length of service cartridge about 8".5 inches; diameter about 6".5 inches. The cartridges for the 40pr. have paper cylinders inside the cartridge and lubricators screwed into the choke end. Cartridges should be ignited at about four-tenths of their length from the rear.

*Projectiles.*—The projectiles for the 64pr. R. M. L. guns are: Common and Shrapnel Shell and Case Shot. Projectiles for the 40pr. R. B. L. guns are: Common, Segment, and Shrapnel Shell, and Case Shot. Solid Shot are used for practice only.

*A Common Shell* is made of cast iron having a cylindrical body and ogival head in one piece. Is cast thicker at the base and head than at the walls, which are sufficiently strong to withstand the shock of discharge. Is cast hollow, lacquered internally to prevent premature explosion. Has a gun metal fuze socket tapped to the G. S. gauge to receive a percussion fuze or gun metal screw plug. The 64pr. shell has three rows of copper studs, three in a row, set on at an angle of one turn in forty calibres to correspond with the rifling. Is painted black, except the studs, and is about 16 inches long.

*A Shrapnel Shell* consists of a cast-iron body, with a chamber in the base ; it is weakened internally by 6 longitudinal grooves, forming lines of least resistance. The chamber contains a tin cup to hold the bursting charge ; over that is placed an iron disc or diaphragm pierced with a hole in the centre tapped with a thread ; into this is screwed a wrought-iron tube, over which is fitted a wooden cylinder. The inside of the body is lined with brown paper. It is filled with 234 (the 40pr. has 164) bullets hardened in antimony, and hot resin is poured in to fill up the interstices ; over this is fitted a wad of felt or kamptulicon. The head is of elm, and ogival in shape ; it has a hole in the centre, in which is fitted a gun metal fuze socket, the bottom of which is fitted into the wrought-iron pipe, and is tapped with a thread to receive the primer, which screws into it. The head is covered with a thin shell of Bessemer metal attached to the body by steel rivets and solder. The shell for the 64pr. gun has three rows of studs, three in a row ; is about 13 inches in length ; is painted black except the studs. The tip is painted red.

*Segment Shell* differ from common in having a lining of cast iron segments.

*Case Shot* are used with all guns. Are made up as a rule of one or more pieces of sheet iron, riveted together to form a cylinder ; the ends are fringed and turned in, to one of which the bottom is attached. Inside the bottom is placed a loose disc. Filled with iron sand shot packed in clay and sand. The top is an iron disc fitted with a handle. Case Shot from heavy guns would generally be used against boats or bodies of troops at from 600 to 1000 yards, which is its effective range.

*Gas Checks* are discs of copper slightly concave to the rear, having a thick rim and three projections to take the rifling in 64pr. guns. They are attached to the base of the shell by a hexagonal nut. Their use is to lessen the windage, by expanding on the firing of the gun, and thus prevent the bore being scored by a rush of gas around the shot.

## FUZES.

There are two classes of Fuzes in use in the service ; viz., Time and Percussion.

*Time Fuzes* are ignited by the shock or flash of discharge, and are so arranged as to communicate fire to the bursting charge at the expiration of an interval of time.

*Percussion Fuzes* communicate fire to the bursting charge when the shell strikes or grazes.

## TIME FUZES.

*The 15 Seconds M. L. Fuze* is conical in shape, is made of beech wood, has the composition channel in the centre, driven with 2 inches of slow burning composition (one inch in  $7\frac{1}{2}$  seconds.) Above this is a pellet of meal powder  $\frac{3}{4}$  of an inch long, having a hole bored down its centre. There are six powder channels, connected at the bottom by quickmatch, in a circular groove, and pressed into the bottom of each channel. The paper scale gives intervals corresponding to half seconds and quarter seconds of time of burning. The fuze is painted black and drab, with yellow marks showing side holes, and black lettering.

## PERCUSSION FUZES.

*General Service.*—This fuze consists of a gun metal cylinder slightly conical in form. It is threaded throughout to the G. S. gauge. There are two holes in the head by which it is screwed into the shell. Inside there is a top screw plug, plain brass ball, detonating ring, steady plug with two fire-holes, detonating ball, cone plug with cylinder attached, driven like a tube and having three fire-holes, a lead cup, a copper suspending wire, and bottom screw plug with hole in the centre.

*Action.*—On discharge the wire is sheared and lead cup crushed up, which brings with it the cone plug. This frees the detonating and plain balls. On the shell striking an object, the plain ball strikes the detonating ring and ignites it. The flame passes through the steady plug and ignites detonating ball, if not already ignited by striking the body of the fuze. The flame then passes through the cone plug to the priming in the cylinder and from that to the bursting charge. This fuze does not act on graze nor when fired with reduced charges.

*R. L. Mark II.*—This fuze acts on graze or impact, and consists of a body and bottom plug ; in the centre of the top is a steel needle pointing downwards ; below this is a guard on

which rests a pellet with two projections or feathers. In the top of the pellet, which is made of lead and tin, there is a cap containing detonating composition. The safety pin passes through the head and through the guard which it supports. It is withdrawn at the moment of loading; a small lead pellet closes up the hole and prevents the flash on discharging passing into the fuze.

*Action.*—On shock of discharge the guard sets back, shearing off the two feathers of the pellet, and locks itself on to the pellet by means of the projection on the latter wedging into the undercut recess in the guard. On graze or impact the pellet and guard fly forward and drive the cap against the steel needle, which pierces the thin brass disc and ignites the detonating composition. The flash passes through the fire-holes in the copper disc, and down through the hollow in the pellet, blows out the brass disc closing the fire-hole in the screw plug, and so into the shell.

*Friction Tubes.*—The short friction tube is about 3 inches long and 2-10 inches in diameter. It consists of a copper tube, lacquered inside. It is driven with mealed powder and pierced with a central hole, the top is closed with shellac putty and the bottom by a disc of varnished paper. A hole is bored through near the top. Over this hole is secured a nib piece, containing a copper friction bar roughened on both sides, and smeared with detonating composition. The nib piece is pinched down on the friction bar, which has an eye into which the hook of the lanyard fits. The tube is varnished black.

*Grummet Wads* are circles of rope with cross pieces, used with S. B. guns when firing at less than 3° elevation.

*Wedge Wads* for 64 pr. consist of two 6½ inch wooden wedges connected by a piece of cane 7½ inches long. Used to prevent projectile shifting when running the gun up.

*Primers, Brass, Shrapnel Shell* consist of a metal cylinder tapped to screw into the pipe of the shell. The top is solid, with a cup shaped recess. The bottom of the cup is perforated with three small holes, communicating with loose powder with which the body of the primer is filled, the bottom is closed by a thin disc of brass covered with shalloon. There are two slots in the head for the screw-driver.

*Primers, Vent Piece*, are cylinders of leather paper driven like friction tubes, have 3 strands of red worsted about an inch long on the exterior. Used to carry the flame to the charge in all Armstrong R. B. L. guns.

*Lubricators.*—For use with 40 pr., consist of two hemispheres of tinned iron between which is fastened a pasteboard disc soaked with beeswax and tallow. Are screwed into the choke end of the cartridge.

64 PR. SHOT, SHELL, AND CHARGES.

|                           | WEIGHT<br>EMPTY. | BURSTER. | TOTAL<br>WEIGHT. |
|---------------------------|------------------|----------|------------------|
|                           | lbs. oz.         | lbs. oz. | lbs. oz.         |
| Common Shell, . . . . .   | 57 6             | 7 2      | 64 8             |
| Shrapnel Shell, . . . . . | 66 0             | 9        | 66 9             |
| Case Shot, . . . . .      |                  |          | 49 14½           |

Charges, 64 pr. full, at present, 6 lbs. R. L. G 2., R. L. G. or L. G.

Saluting, 5 lbs. L. G. Blank.

*The implements required* for boring and fixing fuzes and preparing shell are, hand or hook borer and bits, G. S. iron plug key, 1 mallet, 1 large screw-driver, 1 large leather funnel, and filling rod.



## MATERIAL.

A *Standing Carriage* consists of the following parts, viz ; Two brackets and a transom of oak or teak, two axletrees of oak, four trucks of cast iron, stool bed, two large and one small quoin, and elevating screw.

*Allen's brake* is fitted to the carriage for the 64 pr. 58 cwt. R. M. L. It consists of a wooden wedge shod with iron, which is suspended from the side of the carriage by jointed bars, in rear of the front truck, in such a manner that in recoil it jams itself under the truck.

The *Traversing Platforms* used at this station are dwarf platforms with pivot plate, and consist of the following parts, viz : 2 side pieces 16 feet long 12 inches square, 1 head block, 2 transoms, 1 cross block, 2 foot boards, 4 battens, 4 cast iron flanges, 4 wrought iron trucks, 2 wrought iron plates on top of side pieces, 1 bollard, 2 iron stops. The platform has a slope of 5 degrees, weight  $33\frac{3}{4}$  cwt.

A *Common Ground Platform* consists of the following parts, viz : 5 sleepers,  $18' \times 6'' \times 6''$  ; 18 planks,  $12' \times 12'' \times 3''$  ; 1 hurter,  $12' \times 6'' \times 6''$ , and 100 spikes, it is laid having a slope of 3 degrees to the rear for the purpose of more easily running the carriage up.

*Parbuckle Ropes* are  $4\frac{1}{2}$  inch tarred, with a hook spliced in one end 18, 15 and 12 fathoms in length.

*Drag Ropes* are of two natures : heavy, which are of 3 inch white rope 5 fathoms long ; and light, of 2 inch white rope  $2\frac{1}{2}$  fathoms long. A hook is spliced into one end of each.

There are two descriptions of blocks ; namely, Admiralty and Bothway's.

*Admiralty Blocks* are simple wooden shells, bound on the outside in the direction of their length with a rope strap.

*Bothway's Blocks* are iron strapped, the strapping passing inside the shell, and affording a better support for the pin upon which the sheaves run. These blocks are fitted with swivel hooks.

A *Simple Tackle* consists of one or more blocks rove with a single rope or fall.

The following tackles are used in the Artillery service :

- (1) One fixed block which gives no mechanical advantage.

(2) One movable block which doubles the power.

(3) A luff tackle consists of a double and single block. When the single block is movable, trebles the power; when the double, it increases the power fourfold.

(4) A gun tackle consists of two double blocks. When the stranding end of the fall is made fast to the movable block, the power is increased fivefold; when made fast to the other, fourfold.

(5) A heavy gun tackle or 16 foot gyn tackle, consists of a double and treble block, which increases the power five or six times, as used.

(6) A gyn tackle consists of two treble blocks, by which a power of 6 or 7 is gained.

(7) A whip upon whip consists of two movable blocks, one of which is applied to and acts upon the running end of the fall of the other, increases the power fourfold.

(8) A runner tackle. A tackle applied to the end of a rope passing through another block.

*Levers* are made of ash or rock elm. They are of four sizes; namely, 8, 10, 12 and 14 feet in length. They are rectangular at one end, which is called the point, the other or small end being oval.

*Handspikes* are smaller levers, also made of ash, of the same form except that one side of the point is bevelled off to a distance of three or four inches.

There are two descriptions of common handspikes in the service, 6 feet and 7 feet.

Not more than two men should work with a 6-foot handspike or it may break.

*Fulcrum* means a support for a lever.

*Skids* are rectangular pieces of wood, (oak or fir) of various dimensions, used for placing under guns.

*Planks* are largely used in the Artillery service, and are of different lengths and sizes.

*Rollers* are solid cylinders of wood (elm, sabicu, or African oak) used in mounting and dismounting guns, shifting them from carriage to carriage, or in moving them.

There are three descriptions, ground, shifting, and gun rollers.

*Scotches* are wedge-shaped, generally made of elm. Those in the service are, Large, 12 inches long, 6 inches wide, 6 inches deep; Medium, 9 in. x 5 in. x 4 in.; Small, 6 in. x 4 in. x 2½ in.

*To find breaking strain of rope.*—Square the circumference, and divide by 7 for new rope, and by 8 if part worn. The result is in tons.

*To find the weight of rope per fathom :* square the circumference, and divide by 4 to get the weight in pounds.

*The 64 pr. converted R. M. L. Gun* is a 32-64 pr. gun, converted to a 64 pr. R. M. L. gun from a 32 pr. S. B.

Length, 9 feet 6 inches ; Preponderance, 6 cwt. ; nominal weight, 58 cwt. ; calibre, 6.29 inches ; grooves, 3 ; twist of rifling, 1 in 40 calibres. Made of cast iron, lined with a wrought iron tube.

There is another pattern of 71 cwt. converted from 8 in. S. B. of 65 cwt.

*The sighting arrangement* of the 32-64 pr. gun consists of two centre sights only ; viz., a centre hind sight called a tangent scale, and a centre fore sight called the dispart sight.

The tangent scale is 6 sided, marked on 3 sides with degrees, yards, and tenths of fuze. The dispart sight consists of pillar, collar and socket, with steel leaf.

